000 catching of ocean fish in the Far East.

/137/ Natural Resources and Industry
Coal Supply

Transbaykal

•135 Transbaykal in general is not poor in coal, but this coal is divided among numerous individual supplies, which even today are in part removed from transportation and which are highly variable in quantity and quality. As a rule these coal deposits are all of Jurassic age and should be classified predominantly as brown coal in quality. There is no real hard coal in Transbaykal. The most important coal deposits are the following:

1. Tarbagatay, on the right side of the Khilok in the valley, between the Tarbagatay and Tolboga stations on the Transbaykal railroad. The Jurassic brown coal with a heating value of 4,979 calories lies in two seams, 8 meters and 4 meters thick, which are separated from one another by a 9-meter thick layer of earth. The entire supply is declared to be 50 million tons. The exploitation began already in 1890, and is at present carried out in several shafts; water break-ins make the work very difficult. Annually 200,000 to 250,000 tons are extracted.

2. Khalyarta. The coal lies in a terrace in the valley of the Tolboga, a tributary of the Khilok; the mines are 12 kilometers from the Tolboga station and 17 kilometers from the mines of Tarbagatay. The quality of the coal is the same as that of Tarbagatay, only the seams are less thick (4.5 meters and 5 meters). A branch railroad line connects the mines with the Transbaykal Railroad. The total supply is 1,335,000 tons.

3. Chernovskoye, 18 to 20 kilometers west-southwest of Chita, in the vicinity of the Chernovskoye station, where a city with more than 10,000 inhabitants has come into being. The coal lies in the valley of the Ingoda, on the left side of the valley between the two tributaries, the Chernovka and the Kadala, from which the coal apparently continues as far as the city of Chita. The brown coal, which has 5,000 to 5,400 heating calories, is of higher value than the coal in other deposits. Of the five seams, three, which are 1.0 meters, 2.5 meters, and 5 meters thick, have been exploited since 1914. They were begun with open work, but because of the climatic conditions they have now been turned into underground mines. The entire supply

•135 has not been determined exactly; the claims range between 19 and 33 million tons. Before the war the annual production reached 450,000 tons, but now, along with the mines of Bukachacha, these mines stand at the top in production in the Chita Oblast.

4. Kharamangutsk. The coal deposits lie approximately 4 kilometers from the Darassu station on the Transbaykal Railroad in the vicinity of the locality Kharamagutsk. The Jurassic brown coal lies in two seams worth mining; of these the upper seam, which is 1.8 meters thick, is being worked by two mines.

/138/ 5. Kholbon, 20 to 25 kilometers west-southwest of Nerchinsk, on the left bank of the Shilka, where the deposit with a width from 5 kilometers to over 8 kilometers extends along the river. Several mines supply the Jurassic brown coal with a heating value of 4,615 to 5,231 calories from the first and fifth seam, which are 2.5 meters and 14 meters thick. Both open-work and underground mining are used. The other seams are not worth mining.

6. Bukachacha is the most important coal deposit in Chita Oblast. It lies north of the Transbaykal Railroad in the valley of the Bukachacha River and covers an area of 25 square kilometers. It is connected to the Transbaykal Railroad by a branch railroad line 41 kilometers long, which was built in 1929. In all, nine seams have been determined, of which the largest is 6 meters thick. These nine seams, however, don't appear everywhere, and vary greatly in their stratification and quality. Tectonic occurrences have transformed a part of the Jurassic brown coal into a type of hard coal, which is also supposed to be suitable for making coke. Before the war four shafts were worked in underground workings, which were considerably expanded by new installations after the war. Bukachacha today stands at the top in production in Chita Oblast. The total supply is claimed to be 80 to 100 million.

7. Khara Nor, southeast of Borzya, approximately 2 kilometers from the Khara Nor station. The brown coal of Jurassic age here lies in a dry valley, 8 to 10 kilometers wide, under a Post-Tertiary covering of less than 20 meters. All told there are 10 seams here, but of these only two, which are 5 meters and 15 to 17 meters thick, are worth mining. The supply is numbered at 11 million tons. The heating value, which is 5,660 calories, is above that of the usual brown coal. Above all, special attention is called to the high content of volatile elements, which constitute 60 percent and which make the coal especially suited for use for the chemical industry. Mining was begun but then later

stopped. There are no reports on the present situation.

8. Duroy /possibly: Dauriya?/. The deposit is in the extreme southeast of Transbaykal and stretches along the Argun between the localities of Duroy and Kaylastuy. Three seams, which are 0.5 to 1.5 meters thick, extend here over an area of 20 to 25 square kilometers. The quality of the brown coal, which has a heating value of 5,254 calories, is good. The total supply is estimated at 30 million tons.

Still other brown coal deposits have been found on the Argun, but nothing is known of their size and quality.

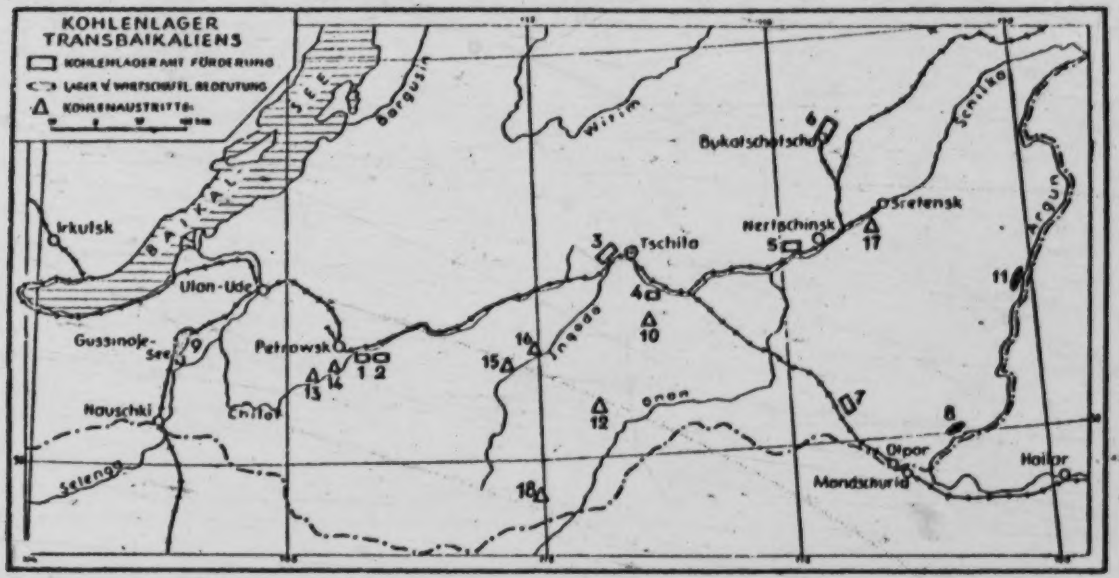
9. Gusinoye Lake. Only in the last few years, after World War II, have the size and importance become known of this deposit on the well-known "Goose Lake" in the Buryat Mongol ASSR. This deposit extends over a great distance northwest and southeast of the lake. All told seven seams, which are 0.80 meters to 9.25 meters thick, have been found. The total thickness of the seams worth mining is supposed /139 Sketch Map of the Coal Deposits in Transbaykal:/ /140/ to be 23 meters. The total supply is estimated to be 200 to 250 million tons. The quality of the coal suffers from the high ash content. In addition to the chemical industry, which has come into being on the Gusinoye Lake, the extraction of this coal is supposed above all to supply the railroad from Ulan-Ude to Ulan Bator. A power station based on this coal is already in production near Tomcha.

Still other supplies are known in addition to these most important coal deposits, but these others have still not been explored sufficiently, and there are no statistics available on them.

Amur Region

In contrast with Transbaykal, the Amur area has coal deposits which have the character and quality of hard coal, although these deposits are also Jurassic formation. The causes for this rise in quality in comparison with the Transbaykal coal cannot be ascertained everywhere in detail. It only remains to follow the sources and to give the corresponding figures. In general the Jurassic coal deposits in the Amur region are very strongly involved in the faulting process, and are divided into a large number of small deposits by elevations, depressions, and breaks along with the ensuing wearing down of anticlines. However, despite this splitting up, these small deposits, for the sake of a survey, can be classified together in individual large basins. Contiguous coal

/Sketch Map of the Coal Deposits in Transbaykal:/



- coal deposits with mining
- deposits of economic importance
- appearances of coal (Kohlenaustritte)

1. Tarbagatay; 2. Khalyarta; 3. Chernovskoye; 4. Kharamangutsk; 5. Kholbon; 6. Bukachacha; 7. Khara Nor; 8. Duroy; 9. Gusinoye Lake; 10. Tyrgetuy; 11. Chalbucha; 12. Ureya River; 13. Katayeva; 14. Kuli; 15. Klyuchevsk; 16. Gorekinskoye; 17. Matsiyevskoye; 18. Brytse River.

/139/

S: Thiel-155K-4.5(no date) 1953 RE. Siberia RR1

●135 fields of a more or less large size occur only rarely.

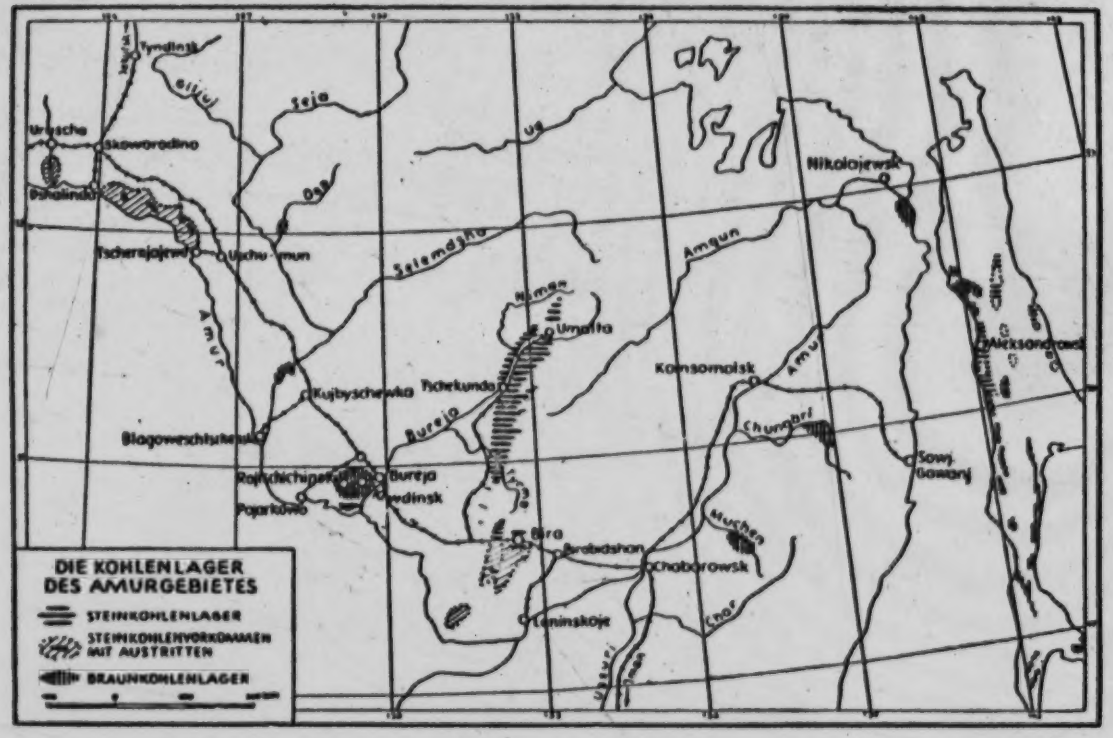
Hard Coal Deposits

1. Birobidzhan. The hard coal deposits here are a continuation of the Hegan coal fields in the Lesser Khingan, which extend from the Manchurian side over the Amur toward the northeast. In Birobidzhan these coal fields appear in numerous small deposits in a total area of 250 square kilometers. The most important deposits are near the city of Bira on the Amur Railroad and extend above all in the valley of the Turuk (Russian Birsko-Turuskoye Deposit). Near the Bira station the coal appears at the surface in a "coal mountain" and is mined here in three seams which are 0.75 meters, 0.70 meters, and 2.10 meters thick. A second deposit lies near the Londoko station and extends toward the north in the valley of the Kamenushka. The other deposits are insignificant.

2. Upper Bureya. Here are the largest coal deposits in the Far East in terms of area and supply. They extend over a total area of more than 4,000 to 5,000 square kilometers, and in this the geological border has still not been exactly determined. The coal-bearing layers extend only slightly on the right side of the Bureya and are limited here in the bulk to a long stretch of 180 kilometers in the region between the Umalta and the Niman. On the left /141//Sketch Map of the Coal Deposits in the Amur Region/ /142/ side of the Bureya the deposits have a greater width; for example, at the tributary, Urgal, seams are found up to a distance of 65 kilometers from the mouth. The complexity of the stratification, caused by tectonic formations, is a great handicap both in exploring and also in exploiting the deposits. The conditions appear most favorable in the central Urgal valley, secondly in the Yoreksko-Olonzhinsk Rayon, and thirdly along the Bureya from Ust'-Urgal to Ust'-Niman. Here up to 20 seams have been determined, but of these only nine, with a total thickness of 40 meters, are worth mining, and they lie up to 600 meters deep. The coal-bearing layers otherwise have in general a thickness of more than 1,000 meters. The quality of the coal varies and ranges in heating value (Yorek deposit) from 6,043 calories to 8,018 calories. Numerous tests and trials have shown that a large part of the deposit can be used as coal for coke; however, the high ash content occurring in many cases forces the use of special methods. The geological total supply is given at 60 billion tons, of which 45 billion belongs to the upper Jurassic and 15 billion to the Lower Cretaceous.

3: Thiel--167K-45 (no date) 1953 RRI Siberia RRI

Sketch Map of the Coal Deposits in the Amur Region:



- hard coal deposits
- hard coal deposits and where they come to the surface /Steinkohlenvorkommen mit Austritten/
- brown coal deposits

/141/

135.

More recent investigations have even estimated the possible total supply at 120 to 130 billion tons. (8) 135

8. Energeticheskie resursy SSSR /The Sources of Energy in the USSR/, 2 vols., (Moscow: Academy of Science, 1937 and 1938), Vol. I, p. 80.

3. Tyrma Basin. This coal basin is a continuation of the deposit on the upper Bureya and is separated from that deposit only by tectonic occurrences with subsequent erosion. The main deposit is on the Bureya. The coal-bearing layer has a thickness of approximately 400 meters and, in addition to various seams of little value, it contains two seams whose thickness varies locally between 1.5 meters and 5.0 meters. The quality of the coal is supposed to be inferior to that in the basin of the upper Bureya. Apart from this, however, it has industrial importance because of its nearness to the Amur railroad.

West of the Bureya, hard coal occurs only in small deposits, for example on the Dep River, 45 kilometers before it empties into the Zeya. The deposit has a supply of only 490,000 tons and is used for supplying the Zeya River ship transportation. An additional, large deposit on the upper Amur has only recently come to the foreground in interest. It stretches along the Amur, and appears in the valley basins of the Amur tributaries, the Urusha, the Kerak, the Burinda, and the Magdagachi with numerous appearances on the surface. Having a mean heating value of 5,064 calories, its quality is slight, but some seams in spots have the character of anthracite and semi-anthracite. Mining was begun in 1947 at Magdagachi.

Brown Coal Deposits

1. Lower Bureya. These are the largest brown coal deposits in the Amur region. They stretch from the lower course of the Bureya in the east to the /143/ Savitaya in the west between the Amur River and the Amur Railroad. They are of the Tertiary period (Miocene and Pliocene), and as a rule, they form only one seam with a thickness of 2 to 7 meters with a mean thickness of 6 meters. The brown coal is in part extracted in open workings. The most important mines are near Kivdinsk and in Raychikhinsk, whose productions before the war reached approximately 700,000 tons for the two mines together. After the war new installations with a production capacity of 250,000 tons

●/135 were created. An inadequacy lies in the fact that the brown coal is very damp in the earth, and, when exposed to the air, it disintegrates in parts into fine grains like sand. The total supply is given at 510 million tons, of which 245 million tons fall in category A-1.

2. Mukhen Deposit, in the basin of the Mukhen River, 130 kilometers northeast of Khabarovsk. Here two seams have been determined with a thickness of 1.6 meters and 3.2 meters; these seams lie only 7 to 10 meters under the surface. The quality is not outstanding and comes close to being a type of lignite.

3. Khungari-Deposit in the area around the middle course of the Khungari River, which empties into the Amur below the Mukhen. The Tertiary coal deposit was discovered only in the 1930's. It constitutes two seams, each 2 meters thick, whose coal has a heating value of 4,017 calories and 5,179 calories respectively.

4. Naloyevskoye Deposit, which also has been discovered only recently. The coal lies on the shore of the Tatar Strait, approximately 20 kilometers south of the mouth of the Amur.

Maritime Krai

The Maritime Krai is relatively better explored than the other regions in the Far East. Therefore, much more can be said about the coal deposits in this area. All told 69 hard coal deposits and 38 brown coal deposits are known to date. In terms of quality, all types of coal exists here, from anthracite to brown coal. Characteristic of this region is the variable stratification with many deposits extending over a large area while others are smashed into smaller individual deposits by tectonic occurrences. The majority of all deposits lie in synclines with stretches predominantly toward the northeast. The coal deposits can be grouped into three groups according to their geological age. The oldest stems from the Upper Triassic (Mongugay Series) and constitutes anthracite and semi-anthracite. The second group, which is of much greater importance, belongs to the Upper Jurassic (Nikansk Series) and to the Lower Cretaceous and contains hard coal primarily. The Tertiary brown coal is reckoned in the third group. However, the age does not always correspond to the quality, since the value of much coal has been changed by tectonic strains. Thus /144/ it comes about, for example, that the Tertiary brown coal of Tavrichanka is very close in quality to hard coal.

Within the coal-bearing Mongugay Series of the Upper Triassic,

three independent coal fields are prominent: the Maikhe-Pochikhe deposit, the Mongugay deposit, and the Razdolnaya deposit.

1. The Maikhe-Pochikhe deposit. This deposit lies between the Maikhe River, which flows toward the south into the Ussuri Bay, and the Pochikhe, a left tributary of the Suifun, and is north of the railroad line which runs from Ugol'naya on the Ussuri railroad to Suchan. Best known is the eastern part between the localities of Surazheyevka and Radchikhinsk. The coal-bearing layers here lie in an asymmetrical syncline which extends over an area of 30 square kilometers; these layers comprise an estimated supply of 300 million tons. Only a small part has been explored with the resulting discovery of five productive seams, with a total thickness of 5 to 6 meters. The heating value lies between 8,616 and 8,757 calories. The heavy interlarding /Durchschichtung/ with dead material and the high ash content, however, lower the quality. The western branch of the deposit directly adjoins on the north the Tertiary brown coal deposit of Artem and stretches from the little river Babalyanso to the Pochikhe. Here, too, the coal-bearing layers lie in a syncline, which here, however, is heavily distrubed. Control prospecting locally have shown three productive seams with a thickness of 1 to 3.3 meters. The heating value, which is 7,646 calories, is somewhat less than in the eastern part of the deposit, but on the other hand the ash content is not so great. Some difficulties for exploiting this deposit lie in the complicated tectonic structure. The total supply of the western part is estimated to be 300 to 400 million tons. Mining until now has still not taken place. However, the beginning of mining is foreseen for the near future.

2. The Mongugaya Deposit is in the southwestern part of the area between the coast of the Amur Bay and the Manchurian border, approximately opposite Vladivostok. It is divided into several individual deposits, which correspond approximately to the river basins of the Mongugaya, Amba, and Bira and which contain a total supply of 200 to 250 million tons. Of the eight seams, however, only three are industrially valuable; they have a thickness of 0.5 to 2.0 meters. The quality of the coal is the same as that of Surazheyevka and has the shortcoming that pure coal is found here, too, only in the small central part of the seam. Mining is not done and is also not foreseen.

3. The Razdolnaya Deposit begins at the Razdolnaya station on the Ussuri Railroad and extends toward the northeast as far as the Zuputnika River. In terms of the area covered it is the smallest of the three Triassic coal deposits. However, it is still very little -

/135 investigated. Natural outcroppings of coal have been determined in numerous places where productive seams up to 1 meter thick are visible but show a sharp fall /starkes Fallen/.

/145/ /Sketch Map of the Coal Deposits in the Vladivostok Area:/

Besides the three large coal deposits of the Upper Triassic mentioned above, supplies of the same age have been encountered in numerous places along the western foot of the Sikhote-Alin', especially also on the right tributaries of the Ussuri. The Boreal Sea which at the beginning of the Triassic period penetrated in a narrow arm from the north into the area of the present-day Ussuri-Khanka depression as far as the extreme south, slowly withdrew again to the north at the end of the Triassic period.(3) In the process the sediments of the

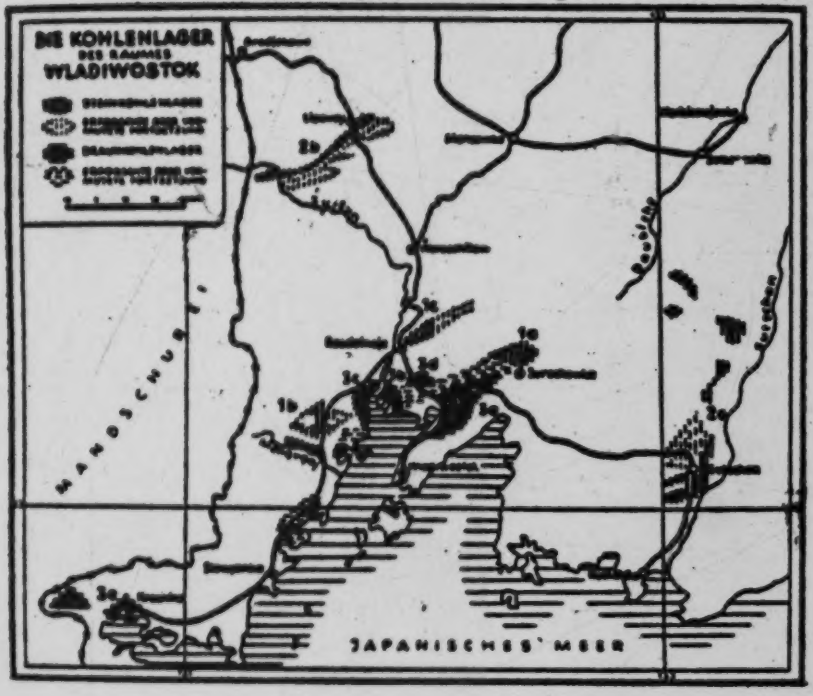
3. Atlas energeticheskikh resursov SSSR /Atlas of the Sources of Energy in the USSR/, Collected work under the editorship of A.V. Vinter, G.M. Krzhizhanovskii, and G.I. Lomov, 2 vols, (Moscow-Leningrad, 1934), p. 7.

Boreal Sea changed from marine deposits to lagoon ones to the continental coal-bearing Mongugaya series, to which the three above-described larger coal deposits belong. Since the deposits of the Upper Triassic extend along the western side of the Sikhote-Alin' in a broad zone, it can be assumed that coal supplies of the same age will also be found further in the north. This is also indicated by the coal findings already mentioned in the area of the right tributaries of the Ussuri; these findings to be sure were made only on geological route surveys.

/146/ The coal deposits of the Upper Jurassic and the Lower Cretaceous have a greater importance than those of the Upper Triassic. In the majority of cases they deliver an excellent fat coal suitable for making gas and coke. The most important and most valuable supplies are concentrated in two large basins: the Suchan Basin and the Suifun Basin.

4. The Suchan Deposit stretches in a syncline with a northeast direction /mit Nord-Ost-Streichen/, and the bulk of it extends on the right side of the Suchan River up to 40 kilometers before the mouth of the Suchan. With a length of 56 kilometers and a mean width of 25 kilometers, the deposit extends over an area of 280 square kilometers. The total supply exceeds one billion tons. Under an unproductive layer consisting of sandstone and conglomerate:

Sketch Map of the Coal Deposits in the Vladivostok Area:



hard coal deposits
explored or conjectured continuation
brown coal deposits
explored or conjectured continuation

The Coal Deposits according to their Geological Age:

Triassic: 1 a Maikhe Pochikhe deposit; 1b Mongugaya deposit; 1 c Razdolnaya deposit

Upper Jurassic--Lower Cretaceous: 2 a Coal deposit of Suchan; 2 b Suifun deposit.

Tertiary: 3 a Artem-Ugol'naya; 3 b Tavrichanka; 3 c Fedorovskiy; 3 d Ippolitovka; 3 e Kraskino.

/Konglomeraten/ and extending up to 1,500 meters on the axis of the syncline, lie three coal-bearing series, which are 300 meters, 150 to 250 meters, and 400 to 500 meters thick. The upper coal-bearing layer contains six seams with a thickness of 0.4 to 6 meters. Within the individual seams the thickness varies greatly; thus, for example, in the second seam from the top, the "Velikan," the thickness ranges from 0.7 to 6 meters. In the second series are more than eight seams, which in the mean are all more than one meter thick. In the third coal-bearing layer there are four additional productive seams, although their thickness and also their quality declines quickly as they get deeper. The coal deposit of Suchan was already discovered in 1888, and mining was already begun at the end of the last century, primarily in order to supply the Russian navy. As at Suchan, the center of the coal mine, the mining installations to date lie in the southeastern wing of the coal-bearing syncline. In 1933 nine shafts were working. Since then more have been added to these. In the last few years the mining has produced more than 500,000 tons. Suchan is connected with the Ussuri Railroad in Ugol'naya by an 180-kilometer long branch line. A second railroad leads from Suchan toward the south to the coast and ends at Nakhodka on the bay of the same name. The excellent quality of the Suchan coal assures the area a development rich in prospects, and, with increased production, coal for export is a possibility, especially export to Japan and China, which are not richly supplied with good coke coal.

5. The Suifun Coal Deposit, in terms of the area it covers, is the largest hard coal supply in the Ussuri country. It covers more than 3,000 square kilometers, and, approximately in the form of a large right angle, extends between the Manchurian border and the Ussuri Railroad. The middle Suifun flows across it on the diagonal. The northern border of the coal-bearing basin is formed by a long Paleozoic granite batholith, which extends under hilly country from Faddeyevka on the Manchurian border via Vladimirovka and Lipovtsy to the east. In the east the basin, in the form of a deep bay, crosses the Ussuri Railroad via Voroshilov /147/ and ends at the Rakovka River, a left tributary of the Suifun. The Yandsogou River can be considered as the conditional southern border, since south of this river the coal-bearing layers are covered over by a continuous basalt covering and the outcroppings of coal are no longer to be determined. The entire coal supply within the Ussuri country is only the eastern spur of a mighty coal deposit whose main part lies in Manchuria and there

•135 reaches as far as Kirin--on the Sungari. The diagonal of the Suifun divides the coal basin in Soviet Russian territory into two parts, a southwestern and a northeastern part, and the two parts are sharply differentiated from one another by the character of the relief and also by the degree of economic-cultural development. The southwestern part forms a mountain tableland country with the original basalt covering being divided by heavy erosion into numerous tableland-mountain-like elevations; the coal-bearing layers appear only between these elevations, primarily in the erosion valleys. Because of its remoteness and its slight connection with the transportation system, this area is very lightly populated. The northeastern, left-bank part of the Suifun basis presents an entirely different face in terms of its landscape. It is free of any basalt covering, its relief forms shallow waves, its soil is fertile, its agriculture cultivates predominantly technical plants, and it is thickly settled. In addition, this region is crossed by the Manchurian Railroad, and in the east also by the Ussuri Railroad; the two railroads meet in Voroshilov. Furthermore excellent loam and limestone are diffused in a large measure in this part, and accordingly the industrial opportunities are especially favorable. Tectonically the coal basin represents a broad, rather flat syncline, which stretches from west to east with the incline steeper in the north, while, on the other hand, it is flat in the south. The basin is filled by two series of Lower Cretaceous, of which, however, only the lower one is coal-bearing. More exact knowledge of the stratification is known only for individual areas, where mining is already underway. Thus at Konstantinovka on the Manchurian border, where coal has been extracted since 1888, there is a seam with a thickness of 1 to 2.5 meters, in addition to some unimportant seams. This seam corresponds to the same coal layer of Ilyichevka, Vladimirovka, and Lipovtsy, all three of which lie on the northern edge of the basin, but here the coal layer reaches a thickness of 3 meters and more. On the eastern edge of the basin where coal is mined in a shaft in Nadezhdinsk three to four kilometers east of Voroshilov, two seams, each 3.5 meters thick, are used; in places these two seams merge into a single coal layer. The total supply of the Suifun deposit is given at 4 billion tons. Since all the shafts and prospectings to date have penetrated only into the upper part of the coal-bearing layer and since geologically these correspond to the upper coal-bearing series of Suchan, still larger deposits are expected to be found /148/ at greater depths, and if this conjecture is confirmed, the total supply would be increased two to threefold.

The quality of the Suifun coal is described as excellent for liquifying coal, and its purity is particularly outstanding. The total amount produced by this mining district is still insignificant and reaches 200,000 to 300,000 tons a year. In this Konstantinovka stands in first place.

The Tertiary brown coal is represented in numerous basins. The most important deposit stretches along the railroad lines to Suchan and extends in a great width from the Ugol'naya branch station approximately 18 kilometers to the east. It covers an area of 180 kilometers and contains several layers with a total thickness of 12 meters. Artem lies in the center of this brown coal region. In coal extracted the Artem area exceeds by threefold the Suchan production of 1938. West of Artem the same deposit is also mined in Ugol'naya and Uglovoye. The total supply is given at 1.5 billion tons. In second place the brown coal deposit of Tavrichanka should be mentioned, which lies on the Rechnoy Peninsula in the northern part of the Amur Bay. The quality comes close to that of hard coal. Approximately 150,000 tons of coal are extracted annually in Tavrichanka, which is connected with the Ussuri Railroad by a 12-kilometer long line. Adjoining Tavrichanka directly on the west is another brown coal deposit, which has six productive seams with a total thickness of 8.20 meters. In the center of this deposit lies Fedorovskiy. Of still greater importance is the brown coal of Ossinovka. This deposit, comprising more than 20 million tons, lies 12 kilometers south of Ippolitovka station, 135 kilometers away from Vladivostok. It consists in the main of a single layer of brown coal, which is up to 19 meters thick and of which a significant portion can be mined in open works without difficulty. The brown coal deposit in the surroundings of the Pos'yet Bay in the extreme southwest is also worth mentioning. Mining also takes place in Kraskino.

Sakhalin

Salkhalin's coal deposits in general have been very little explored. However, the previous determinations justify great hopes. The coal supply lies in three great fields. Best known is the so-called western coal field, which, according to the results of research to date, probably also represents the main supply. It extends along the west coast, lying principally between this coast and the western mountain chain. The coal is of Tertiary age, but because of tectonic stresses it

•135 comes close to the quality of hard coal; indeed, according to individual reports, the coal in part is even supposed to be equal in value to the best type of European hard coal. Accordingly, the coal deposits of the Lower Miocene and of the Upper Oligocene, which /149/ the western coal fields consist of, are designated as hard coal in Russian publications and in terms of its quality the coal is described as gas and coke coal. The coal fields begin approximately 35 kilometers north of Aleksandrovsk, and are divided into more than ten rather large individual deposits, which in most cases lie on the wing of a syncline filled with Tertiary. The value of the individual deposits varies, and both the number of seams and their thickness fluctuates. Thus in the Machinskoye coal deposit, the most northerly, there are seven seams with a total thickness of only 5 meters, while eight productive seams with a total thickness of 20 to 25 meters lie in the Ust'-Agnevo deposit. The geological supply of the western coal fields is given at at least 2.5 billion tons. The mining of these fields began in part before 1931 in individual deposits, for example, in Mgachi, Starovladimirskoye, Arkoza, Makaryevskoye, Oktyabr'skoye, Medvezhinskoye, and other places. By 1933 the total production had already reached more than 250,000 tons a year. Since, however, at that time some deposits were given as a concession to Japan for exploitation, an estimate of 500,000 tons of coal mined at present is not too low. The center of the coal mining region is the already mentioned Aleksandrovsk.

The so-called central coal field should be named in second place; it extends in the depression between the two mountain ridges in the basins of the Tym' and Poronay rivers. Here, too, is Tertiary coal. Nothing is known of the size and supplies of these coal fields since they, too, were only discovered in very recent times. A long and heavily disturbed third coal field stretches in the western mountain range almost parallel to the coast. The coal-bearing layers of this coal field are formed from the Gilyak series of the Upper Cretaceous. This coal area, too, is to date known and investigated only in individual parts; however, the widely-scattered numerous outcroppings in the mountain range permit us to conclude that there is a significant coal supply. Nine productive seams with a total thickness of 10 to 12 meters have been determined in the basin of the Nay-Nay River. In terms of quality the coal here is designated fatty hard coal, but it does have a high ash content.

Considering the great diffusion and mighty development of the

Tertiary on the island, and that geological research is still slight in many cases, it is to be assumed that still other coal deposits will be discovered. Thus, for example, it has been determined that the western coal field continues on the coast toward the north; however, in the process--conditioned by tectonics--the character of the Tertiary coal changes and becomes looser, less valuable brown coal and lignite.

The coal deposits on southern Sakhalin will be discussed in detail in the discussion of the island in the second part of this work.

/150/ Kamchatka and the Northern Regions

Extensive brown coal deposits have very recently been discovered on the western coast of Kamchatka; these deposits stretch from the Sopochnaya River in a broad line over several hundred kilometers to the north of Palana. The coal-bearing layer apparently belongs to the Lower Oligocene. The entire Tertiary layer complex is laid in a fault stretching meridionally and is disturbed also in the same direction by breaks. In the upper part of the coal-bearing series productive seams have been found with a thickness of 1.7 to 2.75 meters. The brown coal is strongly bituminous. At Palana, for which which there is more information, eleven seams with a total thickness of 23 meters have been determined. As at Korff Bay these seams change in quality from lignite in the upper layers to better brown coal in the deeper deposits. There is still no mining done here, but mining can become of very great importance for coastal shipping and also for the local fishing industry.

An additional brown coal deposit has been discovered on the west coast of the inner Penzhina Bay. This deposit is supposed to be the same in age and quality as the deposit in west Kamchatka.

Of considerable economic importance even at present are two coal deposits on the coast of the Bering Sea, at Korff Bay and at the mouth of the Anadyr'. The deposits on Korff Bay stem from the Lower Miocene and consist of eleven seams worth mining, with a total thickness of 20 meters. The mean heating value reaches only 4,160 calories. The supplies are numbered at 100 million tons. The center of the mining is Ugol'naya. The brown coal at the mouth of the Anadyr' is divided into three deposits, of which the best known is the one on the little river, the Ugol'naya, which empties into the Anadyr' Bay from the left. This deposit on the Ugol'naya River has two seams which are 1.5 meters and 5.8 meters thick. Here, too, mining is being done

135 which is of greatest importance for supplying shipping. Korff Bay and also the mouth of the Anadyr' are, therefore, especially important bases for the Northern Sea Route.

Total Production. The amount of coal mined in the Buryat Mongol ASSR and in Chita Oblast cannot be given with certainty. The estimate given above of 3 million tons mined in 1950 is considered somewhat high. In the other Far Eastern regions mining is being pushed very hard. By evaluating all reports, it can be assumed with certainty that production has reached a total of 13 million tons. In this the mining in Korff Bay and in the Anadyr' area must be very insufficient, because press reports complain of a coal shortage in the entire area of the Okhotsk coast and in the extreme northeast, with the result that hundreds of thousands of tons had to be transported there from the southern coal districts. How far the Russians have succeeded in /151/ getting the Japanese coal mines in southern Sakhalin back into operation cannot be said. Before the war these mines delivered 2 million tons a year, of which 75 percent was used in Sakhalin itself and only 500,000 tons were exported to Japan.

Petroleum

The search for petroleum on the continent has thus far been in vain, although Tertiary deposits, which could above all awaken hopes, are also widely diffused here. However, these show themselves for the most part to be continental formations. Certain hopes are still placed on the Amur area. Petroleum deposits and supplies have to date only been found on the extreme edge of the Far East--on Sakhalin, Kamchatka, and further in the peripheral north, where the appearance of petroleum appears possible in the Anadyr' depression and parts of the Chukchi Peninsula because of their geological structure.

Sakhalin

The first reports of petroleum supplies on Sakhalin go back to 1880. Investigative drillings began already in 1892. Worthy of mention in this connection is the work of a German by the name of F. F. Kleis, who founded a German-Chinese company and who contributed significantly to the development of the oil area from 1898 to 1914. With the outbreak of the world war he was expelled, and the work was stopped. A Russian and an English company were also working

at the same time with him; however, the results in general were of slight economic importance. In 1920 the Japanese occupied the island. They recognized the value of the petroleum deposits and immediately began to exploit them. By 1923 already 1, 252 tons had been produced. After the withdrawal of the Japanese, a geological investigation of the island was conducted in 1925 in connection with the petroleum supplies, and at the same time the Soviet Union began the planned exploitation of the petroleum fields. 135

Natural outcroppings of the petroleum are widely diffused in the eastern coastal plain and extend in a zone from Okha in the north to Okuni in the south. In many places they represent mighty accumulations of asphalt or form tar-like deposits in the so-called asphalt lakes. The bulk of the surfacing is connected tectonically to the continuation of the eastern anticlinal fault of the East Sakhalin mountain range. Natural outcroppings are very rare on the western coastal plain and are known only in the most northerly part near Langry.

The bulk of the petroleum lies under the east coast. Here a total of six deposits can be differentiated; they follow one another from Okha in the north along the coast to approximately the latitude of Aleksandrovsk. The oldest and best known of the deposits is that of Okha. It lies on the western shore /152/ of the Urkt Bay and extends to the south as far as the Gilyako-Bunan River. Here up to sixteen oil-bearing horizons have been determined, of which, however only four in the main deliver oil. The two uppermost horizons are already cut into by erosion and have no economic importance. The third, which lies right under the surface of the earth, has caused the formation of the "Great Asphalt Lake" in a natural outcropping on the Beryakan River; the "Great Asphalt Lake" covers an area of 3 hectares, and the pure asphalt mass has a thickness of 0.5 to 1.5 meters. The upper layer of this mass is hard, but in the summer heat it softens up so much that one cannot enter the "lake." The thickness and also the oil yield of the individual horizons varies from place to place. Only the thirteenth horizon has sufficient gas pressure for a gusher to produce for a short time a quantity of 500 tons per drilling and per day. In addition to oil, natural gas is also extracted in Okha, with the quantity produced per drilling and per day fluctuating between 5 cubic meters and 2, 500 cubic meters. The productive drillings in Okha extend down as much as 760 meters.

Approximately 10 kilometers south of Okha lies the center of

935 the next oil field, that of Ekhabi. It stretches between the Gilyako-Bunan and the Khutska Rivers. In the tectonics of the deposit the anticlinal structure of Okha is repeated, but here the deposit is divided into three deposits by cross breaks, which follow one another from north to south. In the last years before World War II the northern part of the oil field of Ekhabi was opened up, and thereby it was determined that Ekhabi is a far richer and more productive field than Okha. The corresponding horizons often produce many times as much as those of Okha. The increase in production is remarkable: it grew from 62,763 tons in 1937 to 165,900 tons in 1938. It is hoped that the extraction in Ekhabi can still be increased and can be maintained for many years. The depth of the drilling in 1938 lay between 650 and 700 meters.

South of the Kydylanya River, which empties into Pil'tunskiy Bay, there begins another oil area, which reaches as far as Chayvo Bay and which usually is grouped under the name Kydylanya-Chayvo-Oil-District. The most important fields from north to south are as follows: Paromay, Pil'tun, Nutovo, Garomay, and Baotasyn. In this oil district the oil-bearing horizons in many cases, lie deeper than those in the Okha and Ekhabi area because of dislocations; but the horizons at the Kydylanya-Chayvo Oil District are connected to the same anticline: only the tectonics become more complicated toward the south. In the southern part there are even two oil-bearing anticlines. In the vicinity of Nutovo there are several asphalt lakes, of which the largest contains 11,000 tons of asphalt. South of the mouth of the Tym' begins the Nyysko-Nabilskiy Oil Region, which got its name from the bays lying on the coast. Here, too, several oil fields have been determined, among which the Katangli field stands in first place. Some exploratory drillings in this field resulted in such a /153/ spurt of oil that extraction was begun in 1937. Four other fields are of industrial importance. The deposits here are connected with two anticlines, with the oil-bearing horizons being the same as those at Okha and Ekhabi.

On the western shore of Sakhalin in the extreme north two oil fields were found, and exploitation here too was begun immediately, because of their favorable location in terms of transportation. The first field, which bears the name Langry, lies 20 kilometers above the Langry River, and the second field lies approximately 15 kilometers to the north on Lake Sladkoye. Both fields belong together tectonically, and both have the same oil-bearing horizons. Here, too, the flanks

of the anticlines are the bearers of the oil. Langry lies scarcely 100 kilometers away from Nikolayevsk on the Amur, and it is understandable that production in both fields is therefore being strongly pushed. 135

In contrast to northern Sakhalin, the southern part of Sakhalin, which was Japanese until 1945, appears to have no oil deposits worth mentioning. Although the Japanese employed the most modern research methods here, they only succeeded in finding traces of oil or small supplies, which did not seem worth while to exploit.

Kamchatka and the Northern Regions

Natural outcroppings of petroleum have been known on the east coast of Kamchatka Peninsula since 1913. Explorations, however, have only led to the finding of one oil field. It lies in the northern part of Kronotskiy Gulf, approximately 60 kilometers from the coast in the valley of the little Bogachevka River, from which the oil field got its name. The Tertiary deposits (Oligocene-Miocene) in the Bogachevka area are, however, covered over by a Quarternary lava layer which is 500 to 600 meters thick; the Tertiary deposits come to the surface only at the exit of the valley, where oil-bearing layers are encountered, but only slight quantities of oil and gas are produced by these layers. Exploratory drillings, which have been made within the lava fields by making use of fissures, have indeed brought indications of extensive deposits, but extraction is made extraordinarily difficult and in places impossible by the thick masses of lava and tuff lying over the deposits.

In 1936 oil was found also on the western side of Kamchatka in the area around the village Tigil'. The deposit lies in an area which is more than 20 kilometers wide and 80 kilometers long and which extends along the coast of the Sea of Okhotsk. The village of Tigil' lies in the center. The oil supplies are connected to flat anticlines. The oil-bearing layers are of the Miocene era and have a total thickness of 500 to 1500 meters. The oil is found in sand horizons which are interrupted by dark gray loam, in which /154/ brown coal seams are deposited. These brown coal seams in places attain a thickness of 0.5 to 1 meter.

Additional oil supplies are found in the river basin of the Penzhina and in the hinterland of Korff Bay.

Importance and Exploitation

The importance of oil extraction for the Far Eastern regions of ooo

000 as being too high.

Peat Supply

•135 The formation of swamps and the formation of peat probably stand in close connection with one another, but the formation of swamps does not always lead to the formation of peat beds. This is in large measure the case in Transbaykal. The irregular water conduction of the rivers brings with it floods and heavy soaking of the ground near the rivers, and accordingly in the valley areas this is often accompanied by swamps. However, only occasionally are peat beds of a larger size found in these swampy areas, and thus Transbaykal has at its disposal only slight peat deposits. Conditions in the other areas are different. The Atlas of Sources of Energy in the USSR gives some figures on this; but these are only general figures, designed to orient; and, as is often emphasized, they should not be regarded as exact data. They are to be used here because they contribute to a clear representation of the land and its conditions. Investigations of individual regions have lead to the general knowledge that of the entire mainland in the Far Eastern region (not including Kamchatka and Sakhalin) around 15 percent is swampy: i.e., in absolute figures, there are approximately 360,000 square kilometers of swamp area. The reason for this extraordinarily high percentage is, in the first place, to be found in the existence of the permafrost, and, in the second place, it goes back also to the extensive tundras in the northeast. Furthermore, research has shown that of the swampy areas, around 10 percent consists of peat swamps which contain peat deposits of economic value. Since from tests and experience in the Soviet Union one reckons on a mean thickness of the peat layer of 1.5 meters, of which, however, only approximately two-thirds can be extracted, one finds that there are extraordinarily large peat supplies in the Far Eastern regions. But these figures should not be considered further, since their value was only calculated theoretically and their realization still lies in the distant future. More important are the peat deposits in the areas already opened, for these have an economic use which is tangible.

In the Aumr and Ussuri region extensive peat deposits are known. They extend primarily in the valley areas around the rivers. In so far as they lie within the food areas, they are economically of slight value because of their great dampness and their high ash content. It is different with the peat deposits which lie on old river terraces or also often

on the watersheds between the tributaries. These deposits are distinguished by their great thickness and their slight water and ash content. The peat deposits which have formed in the foreland of the mountain ranges have the same character. According to Soviet figures, these types of peat in an absolutely dry condition have a heating value of 4,600 to 5,100 calories per kilogram. In individual regions under morphologically caused conditions true peat massifs have developed covering a large area. The Amur depression below and above Khabarovsk is especially rich in peat deposits of this type. Approximately 80 kilometers below the city, between the right tributaries of the Amur, the Nemptu and the Mukhen, lies an extensive peat massif, which, in the discussions of new plans for this area, is always named in first rank as the basis for energy here, and which for this reason should be characterized here briefly as an example. The peat deposit is divided into five fields with the following dimensions:

Name of the Deposit	Area in hectares	Supply in Millions of Cubic Meters	Possible Capacity of the Power Plants in kilowatts
Mukhenskoye	8,090	61.8	22,500
Nel' tinskoye	1,739	27.5	10,000
Industializatsiya	1,546	17.8	6,500
Amkhalginskoye	15,000	180.0	65,000
Yuskovskoye	10,000	97.5	34,700
	36,375	384.6	138,700

Soviet planners have reckoned that the power plants listed in the above table could in around 25 years reach the designated output by putting in 5,000 hours of work a year. These figures are introduced here only in order to show what economic importance the great peat deposits can have.

There are additional important peat deposits in the area of the lower Amur, in Birobidzhan, then especially also in the area between the Sikhote-Alin' and the Ussuri. The peat deposits in the other regions are still little investigated and are still not included in any plans.

If the large peat deposits are still not being used at present, they nevertheless already form the objects of far-sighted planning, and the /157/ time may come when peat power stations will arise from

these peat deposits, such as we see already in action today in the European part of the Soviet Union.

The Iron Ore Supply and the State of Its Exploitation

The iron ore supply of Transbaykal and the Far Eastern region does not constitute a very important percentage in terms of area in comparison with the other parts of the Soviet Union. Transbaykal provides 5 percent of the total area and, according to the state of exploration of January 1, 1938, it conceals in its soil only around 265 million tons of iron ore, not counting iron quarzite. This constitutes only 2.2 percent of the total supply of the USSR. With the Far Eastern regions the difference is somewhat greater; for in terms of area these regions provide 12.5 percent of the total but only 1.6 percent of the supply, which in absolute figures is 187 million tons. In this, however, it is necessary to point out the areas still not completely investigated; the percentage of these in the Far Eastern regions is still especially great, and accordingly there is certainly the possibility of finding new ore deposits.

In the following sections only the most important deposits are to be treated in so far as they are known to date.

Transbaykal

1. The iron ore deposits of Balyaginskoye are undoubtedly the most extensively known and also developed. They form the basis of the foundries of Petrovsk-Zabaykal'skiy, and lie 22 kilometers northwest of these foundries and are connected to them by a railroad line. The ore appears as magnetite in the form of sticks /Stöcken/ and lenses /Linsen/. The iron content is 45.5 percent to 47.2 percent, while the percentage of phosphorus is 0.042 percent and that of sulphur is 0.90 percent. Until recently the mining was still done in open works, but today already it is done in underground works. The ore is broken into pieces on the spot and is enriched by smelting. The supplies are given in the individual categories as follows: A is 2,851,000 tons, B is 288,000 tons, and C is 308,000 tons. The amount of iron ore mined amounted to 113,000 tons annually at the end of the second Five Year Plan. Since because of the completion /of a building/ the capacity of the iron foundry in Petrovsk-Zabaykal'skiy has in the interval been increased to 150,000 tons of crude iron, a mining of from 300,000 tons to 350,000 tons of ore a year can be assumed, and accordingly with

the supplies given above it can be reckoned that the mines will soon be exhausted of ore and the opening of other ore deposits will begin.

2. The Balbagarskoye iron ore deposit lies in the Kurba Rayon in the valley of the Kurba River, which comes from the northeast and empties into the Uda approximately 75 kilometers above Ulan-Ude. The deposit begins approximately 60 kilometers from Onokhoy, the next railroad station, and is divided into numerous scattered, individual deposits, which consist of a conglomerate of hematite and /158/ quartz. The total supply of A plus B is 2.4 million tons and of C is 81.7 million tons. Nothing is known about the iron content, but an enrichment on the spot is regarded as necessary.

3. In the Buryat-Mongol ASSR some deposits of iron quarzite have been found, which, according to estimates, should make a total supply of 120 million tons. Of this the largest deposit, that of Mudgor Gorkhonsk, alone has a supply of 96 million tons. Iron ore deposits of secondary importance have also been determined at Mysovsk /now: Babushkin/ in the vicinity of the shores of Lake Baykal.

4. In eastern Transbaykal the most important iron ore deposits are concentrated in the area around Nerchinskiy Zavod. Here lies the often-mentioned Zheleznyy Kriazh, the "Iron Mountain Range," an important iron ore deposit consisting of magnetite. This deposit stretches over 12 kilometers and is supposed to contain a total supply of A to C iron amounting to 112 million tons. The iron content ranges between 40 percent and 60 percent. The ores contain sulphur and arsenic. Forty kilometers from Nerchinskiy Zavod, in the vicinity of the Argun, lies the iron ore deposit of Berezovskoye, which consists of limonites and which has a total supply of A to C ores amounting to 75 million tons. In the same area, whose waters drain into the Argun, additional iron ore supplies have been determined, those of Yakovlevskoye /now: Privolzhsk/, Bystrinskoye, and Beklemishevskoye. According to superficial estimates, the total supply of iron ore in East Transbaykal is assumed to be some hundreds of millions of tons. The remoteness of these deposits, especially the lack of coal which can be made into coke--the next coal district, whose coal, furthermore, can only in part be made into coke, is Bukachacha--makes it appear scarcely possible that the east Baykal iron ore deposits will be used in the near future.

Amur Area

1. The Bureya Mountain Range contains the largest iron ore

•135 deposit in the Far Eastern region. In a zone 100 kilometers long, this deposit extends from the Amur to the northeast and lies for the most part in the Jewish Autonomous region. All told ten supplies have been determined, which can be grouped into four groups. The most northerly of these, the Botomskoye iron ore deposit reaches as far as Kimkan on the Amur Railroad. The type of ore varies: in part it comes close to hematite. The iron content is the greatest in the north where it has a mean of 48 percent, and it decreased in the direction of the Amur, where it fluctuates between 34 percent and 43 percent. The total supply of A to C ores is given at 59 million tons. An older figure for the total supply, including the ore in category C_2, was 500 million tons, but this must undoubtedly be greatly adjusted because of more recent determinations; for, according to the research as of January 1, 1938, the total iron ore supply in the Far Eastern region (Krai Khabarovsk and the Maritime Krai) is only 187 million tons.

/159/ 2. At Nikolayevsk on the Amur, lying in the vicinity of the city, are iron ore deposits whose ore has the character of limonite and has an iron content of 26 percent to 45 percent. The supply of A plus B is given at 14.2 million tons, to which 9.5 million tons of category C ore can be added; thus the total supply is 23.7 million tons.

The iron ore deposit of Nikolayevsk is supposed to supply the iron foundries of the combinat "Amur Steel" in Komsomol'sk. Formerly there was a steel plant and a rolling mill there. Since the capacity of the blast furnace envisaged there is planned to be approximately 500,000 tons of crude iron, Nikolayevsk's supplying of this installation will, from the long range point of view, soon lead to difficulties, and accordingly the deposits in the Bureya Mountain Range must in the foreseeable future be drawn into this. There are no further reports on the iron plant originally planned to be built in the vicinity of Kimkan and to use the ore from the Bureya Mountain Range; this plant was to be supplied with Bureya coal from the Tyrma Rayon. But this project must probably still not have gotten beyond the planning stage.

Maritime Krai

1. The magnetite of the Ol'ga group on the coast of the Sea of Japan constitutes the largest iron ore deposit. This magnetite as a rule appears in contact-metamorphic deposits at the points of

contact with lime and granite. This ore is divided into various individual deposits, of which the following three are the most important: Belaya Gora (1,150,000 tons), Magnitny Mys (143,000 tons), and Mramorny' Mys (82,000 tons). The ore of the Belaya Gora deposit has an iron content of 50.7 percent to 58.9 percent and is especially valuable because of its manganese content of up to 2 percent. Additional deposits are on Anna Bay. The general reserves of the Ol'ga Group, including the ore in category C_2, are numbered at 29 million tons.

2. The iron ore deposit of Sudzukhete, in the valley of the Sudzukhe River, lies at a distance of 43 kilometers east of the Suchan coal district. The type of ore varies greatly and ranges from magnetite to brown hematite of the contact-metamorphic type. The iron content ranges between 34 percent and 61 percent. Nickel is also mixed in in places. According to superficial estimates, the supply is given at 1,150,000 tons.

3. At Pos'yet Bay, directly on the coast of the Sea of Japan, 50 kilometers away from Vladivostok, lies another deposit, whose supply, however, is not very significant. It consists of magnetite sand with an iron content of 31 percent to 63 percent and has a total supply of 1.3 million tons.

4. The iron ore of Sergiyevskoye, which lies 7.5 kilometers from the Talovka station on the Manchurian branch of the Ussuri Railroad, is just as favorable from the point of view of transportation as is the Pos'yet deposit. At Sergiyevskoye is magnetite with an iron content of 34 percent to 61 percent and manganese amounting to 0.61 percent to 1.86 percent. The supply, however, amounts to only 280,000 tons of ore in categories A to C.

/160/ Numerous other supplies are known in addition to the above-mentioned iron ores, but these can scarcely be used in the foreseeable future. Up to 1939 mining of iron ore took place only in the deposits at Ol'ga Bay and Sergiyevskoye. Nothing is known of the present state of exploitation, although the thought is suggested that the iron ores lying near the coast may be used in conjuction with the Sakhalin coal which can be made into coke.

Non-Ferrous Metal

Two areas are especially prominent in terms of their supply of non-ferrous metals. They are southeastern Transbaykal and the Maritime Krai. Zinc and lead with the usual admixtures stand in the

135 foreground in both areas, although in the number of types of metal Transbaykal exceeds the Maritime Krai; for in Transbaykal there is also tin, wolfram, molybdenum, lithium, and others. Copper, on the other hand, is either entirely lacking or it appears in supplies scarcely worth mentioning.

Zinc and Lead Supplies

In terms both of supplies and of production of these two metals Transbaykal and the Maritime Krai have an important position within the Soviet Union. According to Balsak, Chita Oblast and the Maritime Krai supplied the following percentages of the total supply and the total production of the Soviet Union in 1937:

	Zinc		Lead	
	Percentage of		Percentage of	
	the total supply	the extraction of zinc ore	the total supply	the extraction of lead
Chita Oblast	7.00	--	10.20	--
Maritime Krai	4.41	11.5	5,54	12.5
Total	11.41	11.5	15.74	12.5

Transbaykal

In southeastern Transbaykal the non-ferrous metals are concentrated in the triangle between the Shilka, the Argun, and the branch of the Transbaykal Railroad leading toward Manchuria. Here, too, are zinc and lead supplies, which appear in the typical mixed ores with the zinc and lead content ranging in the mean between 10 percent and 15 percent; these ores often contain up to 1 percent antimony and between 0.1 percent and 0.2 percent tin. Copper appears only rarely, and then it constitutes only an insignificant percentage of the metals in the ore, while the arsenic content is often larger.

The total number of zinc and lead occurrences is given at 550, of which, however, only 34 have an importance realizable /161/ economically, i.e., industrially. These occurrences can be grouped into five mining districts according to their geographical position; in these districts are old works already established in the Czarist era.

1. Rayon Aleksandrovskiy Zavod. This comprises five deposits, of which that of Akatuyevskoye is the most important. The ore here

appears in extensive veins. The content of lead (2.85 percent) and of zinc (1.88 percent) is slight, but the silver content, whose mean is 275 grams per ton, made use of this ore feasible economically in the past. The total supply in the rayon is in 1,000 tons:

Category	Ore	Zinc	Lead
A_2	71.3	1.8	1.8
B	270.8	7.0	8.5
C_1	258.6	6.7	7.2
Together	600.7	15.5	17.5
C_2	292.5	8.0	10.5

2. Byrkinskiy Rayon. Like the above mentioned rayon, this lies in the south, approximately east of Borzya, and it comprises five deposits. The most important of these lies at Savinskoye and was exploited by the mine of the same name. The ore here constitutes a stratum-type formation, which comes to the surface in a width of 600 meters and which has a thickness of 15 to 20 meters. The content of lead (4 to 6 percent) and of zinc (4 to 7 percent) is not very important, but extraction is very much facilitated by the favorable stratification. The total supply of the rayon is in 1,000 tons:

Category	Ore	Zinc	Lead
A_2	1,600.0	42.2	27.4
B	609.9	28.4	23.0
C_1	3,530.0	166.8	73.5
Total	5,739.8	240.4	123.9
C_2	458.8	18.7	13.5

3. Rayon Gazimurskiy Zavod. This comprises only two deposits with insignificant supplies. In the Tayninskoye deposit the ore is connected in veins, which appear in dolomite lime. Earlier these deposits supplied the Gazimurskiy plant. The total supply in 1,000 tons is:

Category	Ore	Zinc	Lead
C_1	40.0	4.0	2.0
C_2	180.0	17.6	9.2

4. Rayon Nerchinskiy Zavod. Here twenty deposits press together in a narrow area along the Argun to the north and south of the old,

135 well-known works. /162/ These deposits are in part exploited by the Nerchinsk Works and are therefore the best known. The most important deposits are those of Mikhaylovskoye and Kadainskoye. In the first of these the ore forms stratum-like veins deposited in limestone; in the Kadainskoye deposit, on the other hand, the ore appears also in extensive beds. In addition to zinc and lead, cinnabar is also extracted in Nerchinskiy Zavod. The total supply of the rayon in 1,000 tons is as follows:

Category	Ore	Zinc	Lead
A_2	548.0	84.6	37.0
B	426.5	43.8	20.8
C_1	899.1	60.8	41.1
Total	1,837.6	189.2	98.9
C_2	2,655.2	205.0	134.8

5. Ustkariyskiy Rayon. This comprises only two deposits, Yekaterininskoye and Preobrazhenskoye, in which only oxidized ores are mined and which are processed in the Shilkinskiy Zavod. The supply contains only ores of category C_2 and amounts in 1,000 tons to: ores 1,050.0; zinc, 34.5; and lead 23.5.

After the Bolshevist revolution work in almost all the installations was stopped because it didn't pay. In the last few years a large zinc-lead combination has been erected in Nerchinskiy Zavod. This combination depends on ore deliveries from thirteen mines, which are grouped into three bases. Nothing is known about the production or its size.

Maritime Krai

The zinc and lead occurrences here are limited to a narrow area extending approximately 150 kilometers along the coast of the Sea of Japan, from the point where the Pkhussun empties into the sea in the south to the river area of the Tetyukhe in the north. All told more than 50 occurrences have been determined, of which, however, only fourteen justify economic exploitation. The most important deposits are concentrated in three groups, of which the most northerly lies in the river area of the Tetyukhe, the central one lies between Vladimir Bay and Ol'ga Bay, and the most southerly lies in the area around the mouth of the Pkhussun. The Tetyukhe group is of outstanding importance, having more than 90 percent of the total supply

in the Maritime Krai. These are contact-metamorphic deposits having contact with quartz porphyry and lime in the form of great beds and lenses /Linsen/, which appear both in the main valley of the Tetyukhe and also in the neighboring valleys. The content of zinc and lead in the deposits in the Maritime Krai is as a rule higher than in the deposits in Transbaykal, and in addition silver generally appears in the Maritime Krai too. In this connection attention should also be paid to the deposits on the Great and the /163/ Lesser Sinancha in Terney Rayon, approximately 35 kilometers north of the mouth of the Tetyukhe. Even though the total supply here is not very great, this deposit is distinguished by its very high values; for it contains 23.5 percent zinc, 15.1 percent lead, and 462 grams of siver per ton of ore, while the silver content in the Tetyukhe deposits as a rule does not exceed 280 grams per ton. The total supply of the Maritime Krai is as follows in 1000 tons:

Category	Ore	Zinc	Lead
A_2	804.4	79.1	63.1
B	2,121.6	220.5	99.7
C_1	1,436.4	115.8	47.6
Total	4,362.7	415.5	210.4
C_2	1,974.9	114.8	73.2

The Tetyukhe deposits were already discovered by the Chinese in the forties of the last century. From 1911 to 1919 the Vladivostok wholesale merchant, Briner, worked here, who in 1915 created a concentration installation. In 1924 the mine went as a concession to the British "Tetyukhe Mining Corporation." In 1928-29 there were 55,000 tons of ore mined from here, and from this ore 14,000 tons of zinc concentrate and 6,000 tons of lead concentrate were extracted through flotation. In the first half of 1930, 74,000 tons of ore were mined, to produce 14,000 tons of concentrate. After the installations were taken over by the Soviet regime, two additional mines (Sovetskiy Rudnik No. 1 and 2) were established in the vicinity of the old mine. The amount of ore mined can be reckoned at 85,600 tons for 1937 and at 108,100 tons for 1938. There are no data whatsoever on the further development of these installations.

The concentrates or metals extracted are transported to the harbor installations at the mouth of the Tetyukhe with the help of a 35-kilometer long narrow-gauge railroad line. From the south of the Tetyukhe these concentrates and metals are carried away by the sea route.

Other Resources from the Ground

•135 Copper. Eighteen occurrences are known in the Maritime Krai, but of these only two are worthy of mention, those in the area of Plastun Bay and on the Yaudsukhe emptying into the Dzhigit Bay. The copper content of the ore tests ranges between 5 percent and 8 percent, but as a general mean it is only 1.5 percent, and accordingly economic exploitation appears scarcely possible. The results of research on the Chukchi Peninsula awakened great hopes of copper and other non-ferrous metals, for copper ore has to date been found in five places on this peninsula. All figures indicate a considerable wealth on the Chukchi Peninsula, but nothing has been made known about the type of ore occurrences and their supplies. (See sketch map on p. 164)

/164/ / Sketch Map of the Copper Occurrences on the Chukchi Peninsula/

Tin. Up to the beginning of the second Five Year Plan (1933) Chita Oblast was the sole tin-producing area in the Soviet Union, and even now this region remains decisive in supplying the Soviet economy with this valuable metal. The most important deposits are in the river area of the Onon in southeastern Transbaykal, where four independent deposits have been determined. These deposits extend over an extensive area. The tin content ranges between 0.17 percent and 3.78 percent; the mean, however, it only 0.6 percent to 1.0 percent. The tin is extracted in the works at Khapcheranga and Sherlovogorsk and in the Onon Mine, not far from the Olovyannaya railroad station. A new mine has been established at the foot of the Sokhondo. In production the works at Khapcheranga stands in first place; in this it is aided by the fact that coal lies in the vicinity, which is mined for running the plant. In the Maritime Krai tin is found in the region of the Bol'shaya Sinancha, which has already been mentioned for its zinc and lead ores. At the end of the thirties mining was begun here.

Wolfram is found in the Buryat Mongol ASSR along with molybdenum in the river area of the upper Dzhida, where there is a great works with its center in Gorodok. The plants are equipped with a dressing installation and with conveying railways and suspension railways. The work is favored by the existence of coal, which is extracted not far from the plants. The wolfram deposits of Dzhida are regarded as the largest in the Soviet Union. In Chita Oblast wolfram is furnished by the deposits at Belukha and Bukuka, which are east of the Olovyannaya railroad station. Additional deposits have been found

3: Thiel--185 K-4,5 (no date) 1953 RR1 Siberia RR1

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Sketch Map of the Copper Occurrences on the Chukchi Peninsula

in the valley of the Chikoy, but these have still not been opened up.

Molybdenum is extracted in Gutay on the Chikoy River in the Buryat Mongol ASSR. Occurrences of molybdenum also appear in the /165/ Amur region and in the Maritime Krai. Only a deposit on the upper Bureya has proved to be industrially useful to date. A works for extracting molybdenum and antimony has been erected in the last few years where the Bureya's right tributary, the Umalta, empties into the upper Bureya. The Bureya coal lying in the same area facilitates the work.

Fluorspar is mined in southeastern Transbaykal in six mines. The largest of these are the mine of Kalenguy, in the vicinity of the Khada-Bulak station, and that of Solonechnoye in the Argun River area. Up to 1937 Transbaykal provided 85 percent of all the fluorspar in the Soviet Union. The supply of feldspar is given at more than 1.2 million tons.

Bauxite. A significant deposit of bauxite was discovered south of Lake Baykal at the locality of Okinsk. In 1947 mining was begun, and at the same time an aluminum plant was erected in Okinsk. Another large bauxite deposit has been determined in the Eastern Sayan at Sagakhani-Eshen.

Among the other mineral resources of Transbaykal the deposits of lithium should also be mentioned. According to Soviet figures these should be reckoned among the most important in the world. Various deposits of natural soda should also be mentioned. Furthermore, there are reports of occurrences of asbestos and graphite. There are reports of uranium findings only from the extreme southwest of Transbaykal.

Only the most important minerals could be listed above, and at that they could only be described in so far as they represented industrially valuable deposits or were already being exploited. Striking in this connection is the inadequate connection with the transportation network, especially with the railroads. For even those production places so emphasized in Soviet literature for their economic importance--such as these on the upper Dzhida or Khapcheranga and many others--have no railroad connection to the rest of the transportation network, but rather as a rule are connected only by finished land routes, which, to be sure, can be traveled by trucks the whole year through. Herein lies a restricting factor, which is effective in numerous mining places and which does not allow these places to come to their full development despite the generosity of their installations and plans.

Gold

Without a doubt it can certainly be assumed today that within

135 the gold economy of the earth the Soviet Union can claim for itself one of the first places among the producing countries. From the most varying announcements and other sources it can be concluded that the Soviet Union is striving with all its force and all its energy to expand its gold mining without considering cost problems. However, the results of the gold extraction /166/ has been kept as a strict state secret for a number of years. Absolute silence is also kept on the share of the individual regions in the production, and accordingly exact figures cannot be expected on this subject. But it remains certain that the regions treated in this book continue to include in themselves the most productive gold areas in the USSR, even though the Soviet press occasionally reports the development of new gold fields in other regions. As the best example, the Kolyma area should be pointed out here: it was opened up from Magadan on the Sea of Okhotsk out and has brought the Soviet Far East again into the foreground as a supplier of gold.

In the following description all the gold production areas are to be treated in a clear summary indicating how they have been presented in publications of the Soviet Union both before and during the last war and how they are directed and taken care of by state administrative agencies up to this time. It is scarcely to be assumed that they have been abandoned in the time which has passed since then. In some of the areas newer sources are also used.

In the Buryat Mongol USSR /sic/ the Vitim Plateau is still a productive gold area, which for a long time has belonged to the primary productive areas of Siberia. From the gold streams the gold is extracted with the help of modern dredges /Draggen/ and hydraulic machines. The center of this gold area is Tsipikan, which is connected with Chita by an airline, which is flown regularly. This advances the importance of this area, and furthermore makes it possible that the mining here is directed and controlled by five gold mining administrative agencies.

In East Transbaykal the gold is extracted in numerous places which are, however, more scattered. The gold fields here have been known since the end of the eighteenth century and for the most part they have already become unproductive. Only the remote river valleys are still of significance; for example, the area around the upper course of the Tura (a tributary of the Ingoda) and of the Ilya (a tributary of the Onon), the valley areas of the upper Chita and Uldurga, and, to a lesser extent, some tributaries of the Argun. Accordingly they have moved on to exploiting gold, which has been discovered in the valleys

of the Ingoda, Shilka, and the Chikoy. For this, modern gold ore works have been founded. The most important ones lie in Darasun, approximately 75 kilometers northwest of Nerchinsk, and in Baley in the valley of the Unda, approximately 40 kilometers south of Nerchinsk. In both of these arsenic and other metals are extracted at the same time. 135

The Amur gold fields should be named in third place. They extend over an extraordinarily large area and for this reason are divided into three parts: the Amur-Zeya area, the Selemdzha area, and the Bureya Mountain range.

/167/ The Amur-Zeya area comprises all the gold fields in the sphere of the rivers flowing into the upper Amur, including the Zeya. Some districts are especially prominent here, for example one to the north of the Mogocha station where the valleys of the northern rivers flowing into the Amazar conceal in themselves productive gold streams. Also subordinate to this administrative district are the neighboring gold streams of the rivers flowing toward the north to the Tungir. A second district lies to the north of the Skovorodino station. Here primarily the gold streams of the area around the upper course of the Urusha, of the Oldoy, and of the Urkan, which flows into the Zeya, are processed, in so far as they lie north of the Amur railroad. The areas around the lower courses of the numerous Amur tributaries between the railroad line and the Amur River have already become unproductive since gold washing had already begun in these valleys in 1867. Judging from the number of gold mining administrative agencies--before the war there were four--this district in the Skovorodino area must be very productive. To this district there also belongs the area around the upper course of the Nyukzha, which flows toward the north to the Olekma. While only gold streams are exploited in the above-mentioned areas, in the Zeya district mine gold is represented in rich measure in addition to gold streams. This district encompasses the entire depression between the Stanovoy in the north and the Tukuringra Mountain Range in the south. A base is formed in the eastern part of the southern slope of the Stanovoy in the area of the right tributaries of the Zeya: Sugdzharikan, Bomnak, and Tok. The administrative center here is Mikhaylo-Semenovskiy. Also equally rich in gold is the western part of the depression in the sphere of the right tributaries of the Zeya, the Ushuley, Bryanta, Unakha, and along the entire course of the Gilyuy. Two administrative centers here serve as executive offices for the plants. In general only gold streams are exploited, but in many places here they move on to working the gold-bearing sands lying under the surface of the earth; these sands are brought to the surface in mining-type

135 processes . In addition mine gold also occurs in this region, especially in the Gilyuy area where a mountain especially rich in gold veins has the name "Gold Mountain." However, there are no reports that mine gold is being mined on a large scale here, and, furthermore, these regions are still too little opened up in terms of transportation.

The Selemdzha gold area extends over only a slight area and comprises in the main the gold streams of the tributaries coming from the Dzhagdy Mountain Range to the upper course of the Selemdzha. These tributaries are also only rich in gold in the area near their sources, but, on the other hand, in the drainage area of these tributaries they are rich in primary deposits, which are exploited here on a rather large scale, but mostly with very primitive methods. The administrative center is Karaurak, a second center lies further up in the valley of the Khargy, a left tributary of the Selemdzha.

The gold deposits of the Bureya Mountain Range are insignificant and are remote, lying in the area around the source of the Niman, a tributary of the upper Bureya. The /168/ gold district is subordinate to only one administrative agency, which is in Sofiysk.

Next to the above-mentioned gold districts all others in the area of the Amur-Ussuri region and also in the Maritime Krai are of subordinate significance. Only those districts should be named here which are grouped in a gold mining administrative agency: thus, the gold district in the valley of the Sutar with its center in Radostny' in the Jewish Autonomous Region and three gold fields west of the lower Amur, in the area of the area of the Amgun and Kerbi rivers and north of the Orel Lake. On Sakhalin there is a corresponding district only south of the upper Poronay. In Kamchatka and in the entire coastal area the extraction of gold is scarcely worth mentioning.

In contrast to the reduction in importance of the above-named areas, the Kolyma area has in the last few years stepped into the center of interest almost with a jump. Today it exceeds in productivity all the other gold districts both in the Far East and also in the whole of the Soviet Union.

The first reports of gold occurrences in the area of the upper Kolyma go way back, and there were also reports on Cherskiy. However, only the successful expedition of the Central Institute for Scientific Research and Geological Inquiry, under the leadership of Bilibin, whose report was given in 1932, caused the Soviet Union to proceed to the exploitation of the gold fields in 1933. The first successes and the

knowledge of the wealth of this region were spurs to pushing recklessly forward in the exploitation by using work camps. As a consequence, the Kolyma area today is among the most notorious regions in the Soviet Union, and is one of those most feared, because of the harshness of its climate. 135

For the opening up of this area building was done on the harbor and city of Magadan on Nagayevo Bay. The inhabitants of this city today are estimated to be 50,000. A highway was laid out to connect with the gold fields; by 1940 this highway had already attained a length of more than 700 kilometers, and it connected all the important mining centers. The road is kept usable for trucks the whole year through. The supplying of the entire area is done via the sea route, for the most part via Magadan, and for the rest from the north via the Kolyma. Since these connections, however, are closed off by ice for more than six months during the long winter, they proceeded to create a permanent land connection by building a highway from the center of the gold district to Yakutsk on the Lena. Of considerable importance for the development of this regions is also the fact that hard coal has been found on the Kolyma in the vicinity of the town of Verkhne-Kolymsk. Some Sovkhoz have been founded as a local source of supply for vegetables, milk, and fresh meat. [491]

The main gold fields lie west of the Buyunda, a /169/ right tributary of the Kolyma, primarily in the area of the Srednikan and Orotukan rivers. At first only the very productive gold streams were exploited, but then the mining of mine gold was also taken up. Mine gold is especially rich in the mountains on the Srednikan, on the Utina, and on the Khatynakh. The most important centers of the gold district are Srednikan, Orotukan, Khatynakh, and Seymchan.

Gold extraction in the Kolyma region developed as follows in comparison with the total production of the Soviet Union (Figures are in 1,000 kilograms): 316 433

	1933	1934	1935	1936	1937	1938	1939
Soviet Union	83.0	120.0	149.0	163.0	176.0	192.0	210.0
Kolyma Region	0.3	1.2	8.0	12.3	20.0	30.0	51.0
Percentage of the whole supplied by the Kolyma Region	0.4	1.0	5.4	7.5	11.3	15.6	24.3

(Table continued on following page)

133 Transbaykal/. Material for Doing Research on the Ground in Asiatic Russia. Moscow, 1927.

flat steps, heaped up on one another; they appear easy to climb from the south but break off sharply toward Baykal. However, sharp ridges and pointed, pyramid-shaped mountains appear in the western part, especially in the area of the upper course of the Temnik and the Snezhnaya. Here also lie /211/ /The page itself is blank. Attached to it, however, is a sketch map of Transbaykal: Orographic Scheme/ /212/ the greatest projections of an Alpine type, rich Karbildungen /Karformations/, and other traces of a former glaciation. The bulk of the mountain range has a width of 40 to 70 kilometers and heights of only between 1,200 and 1,600 meters. But the saddles and passes are only 200 meters lower. Outcroppings of basic stone, principally gneiss and granite, occur mostly only on the lower parts of the slopes. The southern and eastern parts present a motley geological picture. Represented here primarily are crystalline limestone and other matamorphic rock, then porphyrite and basalt. In the Khamar-Daban radioactive materials have been determined in addition to other minerals. The bulk of the mountain range is covered [137] with thick forests. Only a few bare gol'tsy project beyond these forests in the eastern part, and only higher Alpine forms project beyond the tree line in the western part. The composition of the forests is strongly influenced by climatic conditions. On the slopes inclined toward Baykal and exposed to the damp and cool northwest winds there is typical Siberian taiga with larches, Siberian stone birch, pines, and others. On the dry southeastern slopes, on the contrary, pines predominate almost exclusively. The flat ridges are covered by an underwood and bush formation.

The Khamar-Daban is separated from the Borgoyskiy Mountain Range on the south by the valley of the Temnik, which flows down to the Selenga. The Borgoyskiy Mountain Range runs parallel to the Khamar-Daban and generally has the same character except for the fact that toward the south it is more heavily broken up /zergliedert/ and with wide, open valleys declines to the extensive graben depression of the Dzhida. In contrast to the Khamar-Daban and the Borgoyskiy Mountains, which are difficult to traverse and not very attractive because of their forest wilderness, the Dzhida valley is relatively well opened up. This goes back to the valley's valuable natural resources. [138] In the area around the upper course of the river there is, in addition to coal, rich supplies of wolfram and especially of molybdenum. These deposits can be reckoned among the richest in the Soviet Union.
[Cf. pp. 238-239--Analyst]

peculiar only to dry climates. At the foot of the Ikatskiy Mountain Range numerous warm springs bubble up; these springs contain above all sulphates. In addition there are mineral lakes, which, like the Alginsk lakes, lies in a basin of sulphate of soda of significant thickness. Below the locality of Barguzin the mountains come right down to the river and shut off the extended valley basin. Here begins the third part of the Barguzin Valley, the breach valley of the Barguzin toward Lake Baykal. On the right side the mountains press forward right to the river and present picturesque, alluring landscapes. On the left side, on the other hand, the mountains withdraw more or less /220/, making free a flat area along the shore. This landscape on the lower course of the river accompanies the river for almost 40 kilometers. Thus the Barguzin Valley presents an extremely remarkable landscape. Epsom salt lakes between alluvial swamps and lakes in the valley basins of rivers rich in water; wide development of sands with dunes and steppe vegetation; traces of desert-like disintegration; permafrost; warm springs; thick taiga on the circumference; snow-covered mountains in the background; all this shows a heaping up of contrasts such as is undoubtedly rarely found on the earth. The area around the upper course of the Barguzin has alluvial sands rich in gold. For the rest this area is traversed only by Tungus reindeer breeders. The other part of the valley basin is an island of settlements in the middle of uninhabited mountain forests. Numerous Russians and Buryat here devote themselves to the breeding of livestock and to very considerable agriculture with irrigation. The rivers coming from the side valleys of the mountain range are used especially for the irrigation of the fields. The center of the main area of settlement is the village-city of Barguzin, which always has several thousand inhabitants. This city lies on the river of the same name. The Barguzin River is also navigable from here down and, via Lake Baykal, it represents the sole connection with the outside world.

[133] [312] [135] [135] [361]

Just north of the mouth of the Barguzin the Svatoy Noz Peninsula adjoins the land. This peninsula forms an island which is 55 kilometers long and is transversed by two mountain ranges which are up to 1,587 meters high. Only later is this island joined to the shore by a flat narrow piece of land. The material for this is supplied by the Barguzin, the heaping up and the alluvium provide for the current and the waves of Lake Baykal. The original view that the peninsula is a continuation of Ol'khon Island has shown itself to be incorrect, as Busch has shown. On the contrary Ol'khon Island is an underwater ridge running to the

The wealth of natural resources is, however, of far greater 135 •
significance for the economic development of the future.* In this 489
connection the non-ferrous metals in addition to iron ore should be mentioned primarily. The still insufficient connection with the transportation network, however, offers the greatest handicap to the exploitation of the natural resources. Apart from the railroad line which runs from Karymskoye to Otpor to Manchuria, there are only land routes available. Even the very important zinc-lead mines in Khapcheranga, in Mangut, and on the Sokhondo can be reached from the Ulstuy station, west of Karymskoye, only by a built-up land route which is around 320 kilometers long. And by the same route, too, the produce of the mines must be brought to the railroad line on trucks. Because of the smaller differences in height the land route along the Onon valley to the Olovyannaya station has recently been used in perference to the above-mentioned route, which crosses more mountain ridges. Also the regions in the angle between the Manchurian side branch of the railroad and the Argun can only be reached by built-up land routes and truck transportation. Borzya on the railroad line appears to be 361
developing here into the traffic center. Toward the east a narrow-gauge railroad leads to the /229/ non-ferrous metal mines of the Argun district, and toward the southwest a similar line leads to Choybalsan in the Mongolian People's Republic. The city itself, located in the middle of the Argun steppe which is rich in livestock, has a large meat plant. In addition to Borzya there should also be mentioned on the Manchurian branch of the railroad the city of Olovyannaya, which has already been mentioned several times and which is known for its tin works. The bulk of the other localities have already been listed in the discussion of the natural resources.

*[i.e. of the Aginsk steppe -- Analyst]

The Vitim Plateau and the Northern Forested Mountain Provinces

To the north of the Yablonovyy Ridge, spreading east of the 133
Ikatskiy Mountain Range, is the Vitim Plateau, which is adjoined on the north by a series of mountain ridges. The entire region represents a forest mountain range landscape, which climatically is very raw and which makes it very difficult for man to make his way here. Agriculture disappears almost entirely here or is limited to small islands which are scattered sporadically. Only Tungus hunters and reindeer breeders in small numbers traverse the thick taiga and pass a laborious life. However, these wastelands conceal extraordinarily rich gold 316
streams, which are diffused especially in the central part of the Vitim Plateau and which have brought into being active gold

361 Only in the southeast in the triangle between the Amur and the lower Zeya is there an agricultural settlement covering an area of any size. In the rest of this region a zone of settlements with many gaps accompanies the Amur and the railroad.

496 The Amur Railroad runs approximately along the middle of the plateau and uses the watershed exactly, since along the watershed there was, for understandable reasons, the best and the easiest opportunity for marking off. A branch railroad, 38 kilometers long, leads from Ushumun station to Chernyayevo on the Amur, in the center of a

0135 region with great prospects for the future, for here only a few years ago hard coal deposits were determined. These deposits stretch along the left side of the Amur between its tributaries, the Urinda and Magdagachi, i.e., approximately around the locality of Chernyayevo mentioned above. The coal is of Jurassic age and lies in individual anticlines, which stretch toward the northeast. Although, judging from individual tests, the ash content of the coal is supposed to be great, the deposits have a prominent significance because they lie in a region /243/ /Sketch Map of the Amur Oblast:/ which formerly had to be supplied with coal from a great distance. In some places the coal-bearing layers are broken through by granite laccolite and porphyry effusions, and thus the coal here has been transformed into valuable semi-anthracite and full anthracite. Nothing is known of the total supply in the deposit designated by the Russians as the "Upper Amur Coal Basin." There are numerous outcroppings on the Amur and in the individual river valleys. Very recently the mining of the coal deposits in the vicinity of Madgagachi has begun.

361 The principal locality in the northwestern part of the plateau is Magdagachi (approximately 10,000 inhabitants); the principal locality in the southeastern part is Shumanovskaya (approximately 25,000 inhabitants). Both of these towns lie on the Amur Railroad.

[487] The Tygda station between Madgadachi and Ushumun has greater significance in terms of transportation. A land route leads from Tygda via Ovsyanka, which lies at the point where the Zeya and the Urkan flow together, to the Tukuringra break-through of the Zeya. This is the shortest land route connection from the Amur Railroad to the gold fields on the upper Zeya and the Gilyuy.

133 /244/ East of the lower Zeya begins the Zeya-Bureya Lowland, which stretches toward the east along the Amur over a broad area extending beyond the lower course of the Bureya. The end of this low plain is prepared by the high embankment of the Bureya Mountain

634 kilometers, and its population numbers /255/ 108,400 (1939), of which
131 approximately half are Jews. This region is drained by the Bira, whose upper valley is also used by the railroad, and by the Bidzhan. Both of these rivers run through broad valley meadows, which are covered with cultivated fields. From the two rivers the region has also received the name of "Birobidzhan," which is often used. The capital of this oblast
361 also bears the name of "Birobidzhan." Lying on the railroad at the point where the railroad leaves the Bira, this city has around 30,000 inhabitants (1939). Worthy of note is a large clothing and knitted goods [294] factory, which is the sole large installation of this type in the entire
• 135 Far Eastern region. The western part of the oblast, which has already been mentioned in the discussion of the Bureya Highland, is rich in the most varied natural resources, of which the coal deposits of Bira and the iron ore of Kimkan are supposed to become the basis for the establishment of a local heavy industry. The Jews are in all occupations, even
241 in agriculture. In the large section of the west the cultivation of wheat and soybeans predominates; in the smaller eastern section, which is influenced by the nearness of the large city of Khabarovsk, the cultivation
234 of potatoes and vegetables and the breeding of dairy livestock predominate.

361 Khabarovsk, which lies below the mouth of the Ussuri on the right side of the Amur, is the administrative and economic center of the entire Amur region. Its favorable location, in terms of transportation, in the center of a mighty river system and at the end of the Amur and Ussuri Railroad has permitted the city to grow very quickly into a large [161] city. Having a population of only 52,045 in 1926, Khabarovsk almost quadrupled its population by 1929 when it had 199,364 inhabitants, and today its population has probably exceeded 300,000. This rapid [39] growth in population goes back above all to the expansion and construction of industrial plants. In the foreground is machine construction, especially the construction of machinery for agricultural purposes, the processing of metal and of wood, and a food industry which is brought together in large plants. As the center of the Amur shipping, Khabarovsk has a shipyard in which coastal vessels are also built. A modern cracking [382] installation has been added to the older oil refinery in order to process [508] the oil from Sakhalin. Khabarovsk is the center of all air traffic in the Far East. Several airports are available, and, in addition, there [241] are plants for the construction of airplanes and automobiles. In the wide surroundings of the city there has developed an agricultural economy which is typical of areas near cities and in which the cultivation of vegetables and the breeding of dairy livestock predominate.

133 meadows on the river, otherwise they are covered with spotty clumps of grass. Where this grass is destroyed, the loose sand shows through, and the wind blows this together into dunes. The shores of the rivers are flat and predominantly covered with meadow, over which the [311] high water extends. The old shore embankments are of greatest importance for human settlement; the broader ridges are as a rule plowed up and used for vegetable gardens, while the areas which become flooded serve as meadows or are used as hay fields. Now and again the entire plain is narrowed down by approaching mountains, or the plain widens to a great breadth with the neighboring depressions adjoining it. In such an area, in wide, swampy surroundings, lies the very flat Lake Bolon' which is 1,200 square kilometers and which is connected to the Amur by a broad water stream. The water level of the lake follows that of the Amur, and when the water is high even a backward flow is to be observed. At Komsomol'sk the hilly mountains come right down to the river on both sides and force the river into one continuous bed. Here ends the contiguous line of the real Amur plain with its magnificently flat relief, /257/ and an irregularly formed landscape begins. Nemerous rows of hills and chains of mountains with heights of up to 500 meters, indeed, even up to 900 meters, make the general picture more lively. The Amur again and again gains in area and widens often like a lake with numerous islands in the broad valley areas and forms in its neighborhood standing water in the form of long lakes in individual basins and old river beds. Despite this, the overall character of the far more broken up Amur plain is determined by the tributaries, which flow into the Amur from both sides in long, often curved, wide valley areas and which increase still more the degree of dividing up of the country. First to be mentioned in this connection is the valley of the Gorin, which extends into a broad depression in the hinterland and which conceals there the big •[135] Lake Evoron. Further down are the plains of the Limuri and Pilda; the area around the upper course of these rivers is known for its gold sands. 133 Finally there is the extended valley of the Amgun which is more than 137 800 kilometers long. The general landscape picture changes its face but little toward the north. Meadow steppes, overgrown with high grasses, are also still typical here, even though the ground becomes ever damper toward the north and the swampiness increases. The same applies also to the appearance of broad-leaved deciduous trees within the forested areas; these forests represent characteristic mixed forests on the lower hills and mountains. In the direction of the

361 563 lie at a distance from the Amur are as good as uninhabited and in many cases are also unknown. Besides the Goldi and Gilyak, who, being fishing peoples, live in fixed dwellings primarily on the Amur and its tributaries, there are reindeer-breeding Samaghir who traverse the region of the Gorin, and the Negidal of the Amgun region, who are smaller in number. The Olcha are diffused on the right side of [135] the Amur. Findings of gold, which have been made on almost all the left tributaries of the lower course of the Amur, have given some spurs to settlement in very recent times. The rivers on which gold has been found are the Limuri, Pilda, Bichi, and it has also been found in Orel Lake as well as on the lower course of the Amgun.

361 The most important localities on the lower course of the Amur are Komsomol'sk and Nikolayevsk. Komsomol'sk lies alone in a vast, unoccupied region of the left bank of the Amur. The city arose only after 1926 from the small fishing village of Perskoye; it was the creation of the Communist youth (Komsomol), from which it has received its name. By 1939 it already numbered 70,000 inhabitants, [161] and today its population is estimated to be more than 150,000. The [34] city has a large river harbor with an important shipyard in which sea- [327] going ships are also built. The largest undertaking is the steel and rolling mill, "Amur Steel," which is supposed to have been expanded to an annual capacity of 500,000 tons of crude iron through the con- [382] struction of three blast furnaces. The already existing oil refinery has been enlarged by the addition of a cracking installation. A second [37] heat power plant is under construction, and a large water power plant was completed some time ago to supply the city with electricity. In addition, the city houses around twenty additional industrial undertakings and promises to become the economic center of the entire 361 area around the lower Amur. Already several years ago the city was 496 connected with the Amur Railroad west of Khabarovsk by a railroad line, which begins in Volochayevka. In order to counteract the difficulties of building a railroad in the damp Amur plain, the railroad was laid on the western edge of the plain and also goes around Lake Bolon' in the west. With this course, new dry areas were opened up to agriculture, and at the same time the rich supplies of wood in the forests /259/ have been brought closer to exploitation. Of greatest significance, however, is the fact that Komsomol'sk is the end of the BAM. By using this railroad the vast areas of the northern Amur country have in Komsomol'sk their nearest exit to the sea. However, the natural unfavorability of the mouth of the Amur has led to a

lengthening of the BAM via the Sikhote-Alin' to Sovyetskaya Gavan', which is the best natural harbor on the coast of the Gulf of Tatar. The railroad for a part of the way uses the middle course of the Khungari, a right tributary of the Amur, in whose basin a large Tertiary brown coal deposit was discovered in 1932. This deposit is supposed to be used to run the railroad. At present the railroad to Sovyetskaya Gavan' already plays an important role in the treating of lumber from the Sikhote-Alin', which is processed for export in a large lumber mill in the harbor city.

Nikolayevsk with its approximately 30,000 inhabitants is the economic center in the region around the mouth of the Amur. It owes its importance above all to the wealth of fish in the neighboring parts of the sea and in the Amur. Accordingly, it has been able to develop into one of the largest centers of the fish-processing industry. The city cannot develop very well as a sea harbor because of the harsh climatic conditions--the ice-free period lasts only around 160 days--and the unfavorability of the mouth. The mouth of the river is closed off by a sand bar of great width, which enables only those ships to pass which have a draught of up to 3.50 meters. In addition, there is the fact that the "Amur-Liman" itself is very flat, has many shallows, and thus permits sea-going ships to travel on it only in a few natural canals. Thus only smaller coastal vessels can get into the Amur, while larger sea-going ships must be unloaded on the open sea and their goods transferred to river vessels. For many years they have been in the process of creating a suitable waterway in the Amur, but the difficulties appear to be too great. Above all the natural deposit of bar sand again and again destroys the work of man.

The Sikhote-Alin'

The Sikhote-Alin' with its mountains fills the entire area from the mouth of the Amur on the north to the steep break at the Bay of Peter the Great. In contrast to this vast expanse, the narrow depression which extends at the western foot of the Sikhote-Alin' and which only in the south has extensive plains, appears to be of subordinate importance, particularly, too, because spurs of the Sikhote-Alin' not uncommonly penetrate almost to the Ussuri, and individual mountains of the Sikhote-Alin's border steps which traverse the entire land, appear even in the plain. Nevertheless, the smaller depression has the greater significance, for in it sits the bulk of the population, and in it

other hand, an elevation still appears to hold sway at present. Many 133
rivers emptying into the sea show delta formations.

As a consequence of the southern current running along the coast, numerous narrow tongues of land separating small bays from the sea have formed. All these tongues of land point toward the south. The deltas mostly lie left of the river courses, which, therefore, show a wandering to the right and which also dig under the shore on the right side. The sea current is weaker and irregular on the southern coast, which is heavily broken up; thus tongues of land here can run in all directions.

The most important bay on the east coast is Ol'ga Bay. It was discovered in 1787 by La Perouse and forms one of the best natural harbors on the coast. Lying off the bay are the small, rocky Chikhachev Islands. The bay itself has a diameter of 3 kilometers and is on the mean 25 meters deep. Once it was at least three times as large and reached much more deeply into the land toward the west. Today the valley areas of the rivers emptying into the bay become swampy. When there is a strong east wind, a backward flow can even be determined. The old marine abrasion terraces are very well preserved on the mountains at a height of 25, 30, and 120 meters. The low mountains surrounding the bay consist of granite, quartz porphyry, and sedimentary rock and contain above all iron /264/ in addition to lead [135] ore containing copper and silver. This iron is magnetite with an iron content of 50 percent; the iron is being mined here. The harbor locality of Ol'ga has several thousand inhabitants. In the hinterland of the bay [361] Russian peasant settlers have made their appearance.

The Tetyuke Bay has a greater economic importance. Here, 316
35 kilometers from the coast, is the most important zinc-lead-silver 504
ore in the Far East. A narrow-gauge railroad connects the mining installations and the preparatory installations with the harbor, which has gotten modern loading equipment very recently. The harbor locality has several thousand inhabitants. Here, too, there are agricultural settlements in the hinterland.

Between the two above-mentioned bays is a third bay, the 133
Vladimir Bay. It is surrounded on all sides by granite mountains which are up to 225 meters high. The bay has a depth of up to 12 meters. Fresh water lakes and swamps enable us to recognize the former larger expanse of the bay. Two projecting rocky peninsulas enclose the bay. Vladimir is known for its installations for the extraction of iodine from seaweed.

regions, the Sikhote-Alin' can still, as always, be designated as rich in forests. Planned exploitation of these forests has still not been begun at all. Of still greater significance for the future are the vastly rich resources of the ground. The southeastern part of the Sikhote-Alin' appears to be a true mine for the latter. However, a large part of these supplies has still not been once sufficiently investigated. The prospects for development along mining and industrial lines are always completely favorable, only an opening up in terms of transportation must pave the paths to the sources.

The extreme southern part of the Sikhote-Alin' is generally relatively thickly populated, and it is also better opened up from Vladivostok on. It already belongs more to the cultivated zone, and economically, too, it is so closely connected with the cultivated zone that it will be treated in connection with the Ussuri-Khanka depression.

The Ussuri-Khanka Depression

The western foot of the Sikhote-Alin' is, for its entire length, accompanied by an extensive depression, which stretches from the Gulf of Peter the Great to the mouth of the Amur, thus covering more than 1,300 kilometers. The Ussuri-Khanka depression forms the larger, southern part of this long depression and has a total length of 700 kilometers from the southern end to the mouth of the Ussuri. As compared with the Sikhote-Alin', this depression represents the sunken part of the land step and is accompanied on the west by the step, again elevated, of the east Manchurian mountain range. In the Tertiary period, the entire depression, as Ivanov (83) assumes, was flooded by the sea, and

83. Ivanov, D.V. The Sikhote-Alin' Ridge /in Russian/. Petersurg, 1896.

thus the Sikhote-Alin' projected from the sea as a long, narrow island. Proof of this view has been attained up to now only for the southern part of the depression.

The bulk of the depression belongs to the drainage area of the Ussuri. A flat watershed, which is scarcely perceptible in the countryside and which has an absolute height of only 190 meters above sea level, separates this section of the depression from that section of the depression whose waters drain off toward the south, i.e., the river

137 appear extensive moss steppes, which have a similar character to that of the tundra, and these regions have an almost polar appearance. The south, on the other hand, has milder traits in places. Since rich
• 135 coal and oil supplies have been discovered in very recent times and since their exploitation has begun, the island is sliding more and more into the foreground of economic interest; the population is increasing rapidly and is adapting itself to the island. With this the bad reputation of the island is also beginning to change.

133 According to the relief, Sakhalin is divided into two parts: a larger, mountainous section in the south, and a smaller section in the north which is gently rolling to hilly. The mountainous south consists of two mountain chains, which run in the direction of the island and which are separated from one another by a depression stamped as a longitudinal valley. The depression is drained toward the north by the Tym' and toward the south by the Poronay.

/278/ The eastern mountain range, whose highest elevations are Nevel'skiy Mountain (2,013 meters) and Lopatin Mountain (1,680 meters), is more heavily divided up than the western mountain range, which also is lower generally and whose highest point, the Aimi Yama, reaches only 1,641 meters. In its external impression, the eastern mountain range should be designated as more of a ridge mountain range. It consists principally of metamorphic rock, slate, sandstone, and limestone which is similar to marble. These are the same stones as those which build up the border chains of the mainland. These sedimentary stones are in many places permeated by syenite, diabase, andesite, and basalt. Granite, however, is lacking. In terms of age, most of the sediment of the eastern mountain range is reckoned as Paleozoic. Mesozoic is diffused only in places and then is only slightly developed. It is different in the western mountain range. This is built predominantly from Tertiary layers, beside the older rock. Jurassic and Cretaceous also lay claim to a significant proportion. Cretaceous appears especially in the southwestern part and is diffused in the former Japanese territory. Weathering effects are very great because of the damp climate; they affect especially the parts of the mountain range without forests. The sharper forms and the greater variety in the relief can be traced back for the most part to the varying powers of resistance of the different types of rock. The loamy and gravelly slate weather especially quickly.

The Tertiary deposits, which have a wide diffusion in all of Sakhalin, and the Cretaceous sediments are heavily destroyed. The

is the alluvial land character of the eastern coast, on which there is 133
one fresh-water lake after another, almost lined up in a row. All
these lagoons are extremely narrow, but they are up to 160 kilometers
long. In contrast to the restless sea, these lagoons permit /280/ a
protected water traffic along the coast. Sandy places with dune forma-
tions, however, are only rarely to be found here. Mostly vast, tundra- [135]
like moss steppes, which consist of peat layers up to 15 meters thick,
spread out here on the lower courses of the rivers, and are especially
extensive on the Tym'. Here, as on the western side of the island,
these steppes are excellent meadow lands for reindeer herds.

The difference in the coastal formation between the western and the eastern parts of the island can be traced above all to the prevailing current. On the eastern side the current goes along the coast toward the south. On the western side a current toward the south prevails within the Tatar Sound on the coast of the continent, while on the coast of Sakhalin an opposing northern current predominates. This northern current, however, as Zhdanko (188) has indicated, does not

188. Zhdanko, M. "Isvlechenie iz doklada v zasedanii I.P.G.O." Excerpts from the Material at the Meeting of the Geographical Society in 1915/, Izvestiia of the Imperial Russian Geographical Society, 1915.

run regularly; rather the current changes in connection with the tides; thus there are only tendencies toward an irregular level coast.

Climatically the low northern part of Sakhalin is the most dis- 137
favored, since no limitations are set to the raw influences of the Sea of Okhotsk. Therefore, the appearance of the Daur larch is just as typical here as the appearance of the Ayan spruce. Toward the south in increasing measure the taiga also has deciduous trees of the same type mixed in as are characteristic of the Sikhote-Alin'. A consequence of the damp climate is not only the moss areas near the coast but also the meadows which appear in the more protected flood plains of the rivers. These meadows have a very heavy growth of grass, which in places is 3 to 4 meters high. Senecio cannabifolia and Petastes japonicus should be mentioned as among the principal types represented here. In the mountains themselves the stone birch, Betula ermani, appears as the characteristic tree in the heights as do the spruces and pines. In more protected valleys stocks of pure deciduous trees are no rarity. Worthy of note is the appearance of wild Kuril

Tertiary fault mountain range zone of East Siberia. On the one side, 133
this mountain chain is supposed to have been connected with Sakhalin, and on the other it is supposed to appear again in the Taygonos Peninsula, in the western part of the Penzhina depression, and in the northern part of the Anadyr' region. In the coastal region this chain appears characteristically in the Chutnavar Mountains, which stretch in a wide peninsula from west to east and which are separated from the mainland mountain ranges by an extensive valley which runs in the same direction. Through this valley flows the Kaza Tau'. The mainland mountain ranges referred to above are spurs of the Cherskiy Mountain Range, and with their ridges and the valley areas lying in between, they run into the Kaza-Tau' valley almost perpendicularly; thus in a narrow area the opposing construction appears clearly. For the rest the Tertiary mountain chain appears only in island remains, on the Koni and Pyagina peninsulas and then on Taygonos Peninsula.

East of the Yama begins the Kolyma Mountain Range, which from here on stretches toward the northeast parallel to the coast and then in the hinterland of the Taygonos Peninsula turns toward the north-northeast into the interior of the land. But, in contrast with the Dzhugzhur, the watershed lies far from the coast. The mountain range slopes toward the coast and is broken up into individual parts by numerous long and relatively wide erosion valleys, which run almost perpendicular to the coast. Thus the general impression remains the same as in the west between Okhotsk and the Yama, where the spurs of the Cherskiy Mountain Range meet the coast at the same right angle. However, in the coastal region of the Kolyma Mountain Range the valley areas and also the coastal plain are smaller in size. In the background of the Gizhiga Bay, between the Kolyma Mountain Range and the Taygonos Ridge lies an extensive depression, which is filled with Tertiary deposits. In this depression coal-bearing layers have also been discovered in very [135]
recent times; these layers contain industrially valuable deposits of brown coal and lignite. Natural outcroppings of the productive seams are even to be observed on the coast of Gizhiga Bay.

The northern location comes out more and more in the landscape 137
picture of the coastal region east of Okhotsk. The protected valley areas are as a rule covered with good meadows, which offer /289/ usable pastures for cattle and horses and which are also rich in hay fields. The courses of the waterways are followed by meadow bushes and rows of poplars. Birches set in toward the upper courses. The slopes are mostly covered with larch forests, which become light and low in the heights.

137 The mountain ridges themselves are either bare or have underbrush and reindeer moss growing on them.

361 563 As a consequence of the contrasts between the protected valley areas and the ridges covered with moss tundra, the hinterland of the coast here is occupied far more by Tungus reindeer nomads than the Dzhugdzhur coast. Also, despite the northern location, the number of coastal localities is larger here than there. Russians, however, are to be found here less often. These localities are predominantly occupied by sea Tungus, who, however, all cultivate some vegetables and potatoes in addition to their fishing. Also--a fact that is especially noteworthy--they follow the Russian example and keep cattle and horses. However, the opportunities which are available here for breeding livestock have still not been long exploited, and thus there are the most favorable prospects here, especially since sufficient hay fields are on hand to assure the supply of winter fodder. The most important localities on the coast are Tauysk, Ola, Yamsk, and Gizhiga, all of which lie at the mouths of the rivers of the same [505] names. During the summer, connection between these localities is [487] maintained by small coastal steamers; during the winter the connection is over the so-called coastal route which leads from Okhotsk along the coast to Kamchatka and which is traveled by horse, reindeer, and dog sleds. All of these coastal localities, however, are exceeded in importance by the newly founded city of Magadan, which came into being only shortly before the last world war and which has already far surpassed the old Okhotsk as a harbor.

135 Magadan owes its founding and its rapid growth above all to the hinterland which is rich in natural resources. Here in the area around the upper course of the Kolyma extraordinarily rich gold fields have been discovered; mine gold as well as gold streams have been found. A more exact exploration of the region showed the existence of hard coal and significant supplies of less common elements. The 361 exploitation, which was taken up rapidly, led to the formation of numerous new localities, and thus there are now more than 50 settlements in the upper Kolyma region. The centers of industrial life lie in the area around the source of the Kolyma and on its tributaries, the Berelyakh and Tenka. The most important of the new localities are Orotukan and Khatynakh. For connection with the outside world 491 a highway was built which can be used throughout the year; this highway leads from Ust'-Utinaya to Magadan on the coast. Since the Kolyma is navigable from Ust'-Utinaya on, this highway has at the

smaller forests appear, and then mostly with badly gown and crippled trees. 137

Permanent settlements exist only on the coast and those are mostly on the Bering Sea. In them live the Maritime Chukchee who devote themselves to the catching of fish and sea animals, and in some villages there are also Eskimo. The sections of the sea near the coast of the Chukchi Peninsula are especially rich in walruses, which are among the main animals hunted here. There are no larger localities. Except for officials, no Russians remain here permanently. The interior of the peninsula is occupied by Reindeer Chukchee, a powerful people, capable of resistance, who own great herds and who are depicted as excellent in the breeding of reindeer. However, because of their small number the general density of population is very low and reaches only approximately 0.03 per square kilometer, and thus one can traverse great stretches without encountering a man. Very recently exploration has uncovered valuable natural resources in numerous places. Thus, iron ore, copper, mine gold, graphite, molybdenum, and also hard coal have been found. Hard coal outcroppings are known directly on the coast of Mechigmenskaya Bay and also in the environs of Cape Serdtse-Kamen'. Pieces of hard coal of excellent quality were also found by Chukchee in the interior. /292/ The greatest part of the natural resources determined to date lie on the east coast, since this alone has to date undergone a more exact investigation. The findings to date permit one to assume, on the basis of the same geological structure, that there are more deposits, and thus in them perhaps one side of the future development of the Chukchi Peninsula is indicated.

361 563 [225] [161] 135.

The Anadyr' region lies south of the Chukchi Peninsula and is bordered on the west by the Anadyr' Plateau and on the south by the Koryak Mountain Range. The central part of this region is taken up by an extensive depression, which is filled with Cretaceous and Tertiary deposits. For the most part this depression is completely level, but it is not unified, for from the north as from the south mountain ranges project into the depression or rise directly from the plain. To the south of the Anadyr', east of its tributary the Mayn are the Alganskye Mountains, which are up to 500 meters high. The course of all these mountain chains and mountain ridges has still been very little explored in detail. 133

The Anadyr' comes down from the plateau of the same name, and in its upper course, where it is up to 170 meters wide, it has the

almost never penetrates into the land, however. 000

The area occupied by settlements is very slight in the east and 361
in the center of the depression. In the west, on the other hand, there 563
are a series of villages on the Anadyr' and its tributaries. Among these, Markovo with its approximately 500 inhabitants has first rank. Russians, too, live in the villages, but otherwise the population is mostly sedentary Koryak, who pursue fishing and the breeding of dogs. In the peripheral regions Chukchee wander more in the north as nomadic reindeer breeders, Koryak wander in the south, and Laumut and other Tungus in the west. Alternation between the excellent mountain tundra in the protected depressions in the winter forms the basis of their life. In large part, these people are still fully nomadic. However, everywhere among them the effort is being maintained to create fixed, permanent winter quarters; and thus with many of these tribes, especially with the Koryak, a transition to semi-nomadism can be determined. Collectivization also has not stopped at these peoples. In 1948 there were in the Koryak National Okrug 40 livestock-breeding kolkhoz (reindeer), in some of which slight quantities of potatoes and vegetables were cultivated. At 70 points along the coast the Koryak have been brought together into fishing collectives.

There are only a few settlements on the coast because of its 361
flat relief offering little protection from the storms. However, the locality of Anadyr', which has almost 2,000 inhabitants and lies at the mouth of the river of the same name, assumes a central position here. This town forms the entrance gate to the entire Anadyr' region [505]
and is regularly visited by coastal steamers. A short while ago rather [135]
large Eocene brown coal fields were found in the vicinity of the locality. ●
The main deposit stretches opposite Anadyr' on the northern side of the mouth of the Anadyr' from the point where the Ugol'naya flows into the foot of the Zoloty Mountain Range. On both sides of the mouth of the Ugol'naya appear two seams, which have a thickness of 1.5 meters and 5.8 meters. Mining is already underway here /294/
and supplies the coastal steamers. In addition, Anadyr' is the central [255]
station of state fishing on the entire northern coast; here the catch of the individual fish collection points are delivered and processed in an important canning factory.

Toward the southwest the Anadyr' depression goes over into the 133
Penzhina lowland, the two being separated only by a gently rolling watershed which is up to 331 meters high. The Penzhina lowland, however, is far smaller in size, and is drained by the Penzhina which

133 flows into the Sea of Okhotsk. In comparison with the Anadyr' region
[137] the climate here in the Penzhina lowland is somewhat milder. The inclination of the ground is greater, and thus the moss steppes widely diffused here are not so very swampy: the larger rivers are accompanied by poplar forests almost everywhere. Toward the mountains there is the same alternation in the vegetation picture as there. At the mouth
361 of the Penzhina lies Kamenskoye, where the coastal steamers land.
563 The capital, Penzhina, itself is a small village lying in the middle of a lonely moss steppe in the interior of the region. Koryak constitute the majority of the small population. They are in part sedentary, living as fishermen in the villages, or they wander as nomads with their reindeer herds on the good grazing grounds of the moss steppes.
• 135 In the Tertiary layers, which fill the Penzhina basin, coal-bearing series have recently been found, which also contain lighter lignite in addition to brown coal of good quality. The deposits are said to stretch almost over the entire Penzhina basin.

133 On the east the Penzhina lowland is bordered by a flat mountain ridge, the Penzhina Mountain Range. The very long moss steppe, the Parapolskiy-Dol, whose character is like that of the Penzhina lowland, stretches on the other side of the Penzhina Mountain Range from southwest to northeast. In the south this moss steppe widens and traverses the entire land narrows which connects Kamchatka with the mainland. Here in the middle of the land narrows the moss steppe reaches a height of 155 meters.

The region between the mouth of the Anadyr' in the north and the land narrows in the south is taken up by a still little known central mountain range, which is usually designated the Koryak Mountain Range, after its principal population. This mountain range fills the entire area as far as the east coast, and its waters in the main empty into the Bering Sea. Traversing the land which is mostly formed like a high plateau are three lines of mountain ranges: the Pal-Mal, the Tingeney, and the Rarytkin Ridge. Like the entire Koryak Mountain Range generally, these three belong to the outer zone of the Tertiary faulting belt and are regarded as a continuation of the Kamchatka Mountain Range. In contrast to the interior which is like a high plateau with a general height of 500 meters, the rivers flowing toward the coast are deeply dug in, and thus from the sea an impression more like a mountain range arises. The bulk of the surface is covered with tundra, only the more protected places and valleys have forests. Reindeer-breeding Koryak inhabit the interior and also constitute the population of the [1295] fishing settlements on the coast.

population of the /295/ fishing settlements on the coast. The center of the fishing and the processing of fish is Ust'-Apuka, west of Cape Olyutorskiy. 361 583

Tertiary brown coal deposits have also been found in the Koryak Mountain Range in Korff Bay in the south and in the Ugol'naya Bay in the extreme northeast. In Korff Bay the deposits have already been mined for years, and the coal from here is used to supply coastal shipping. The coal here is of Miocene age and is contained, as far as the supplies have been investigated to date, in 11 seams with a total thickness of 20 meters. In this the quality of the upper seams is very different from that of the lower seams. The uppermost seam represents typical lignite; the lower seams, on the other hand, are like a gleaming, bituminous coal. Mining is supposed to have been taken up in Ugol'naya Bay also, and a coal base is likewise supposed to have been erected. 135

Kamchatka Peninsula

Like a spearhead Kamchatka Peninsula projects toward the south, separating the Bering Sea from the Sea of Okhotsk. The peninsula covers 270,000 square kilometers and has a length of 1,200 kilometers, which corresponds approximately to the distance from Berlin to Rome. 133

South of the Parapolskiy Dol plateau which stretches across the land narrows, the first lines of heights begin, and these then develop into two mountain chains as the peninsula widens. Between these two chains, the western and the eastern, is imbedded the valley of the Kamchatka River.

The low medium mountain range of the west increases considerably in height south of the Palana River. In the area of the Tigil' River the main chain is richly divided up, is accompanied by parallel chains, and reaches already a height of 1,650 meters. In the area around the source of the Bystraya and the Icha rises the truncated volcano cone of the Ichinskaya Sopka, which projects over its approximately 1,200 meter high ground area to the gigantic height of 3,607 meters. The mighty dome of the mountains is covered with glaciers, from which some hanging glaciers flow down. The water from the melting of these hanging glaciers has torn deep furrows. The Ichinskaya Sopka is the sole active volcano in the western half of Kamchatka; thick smoke rises constantly from its crater. South of the Icha the character of the mountain range changes basically. North of the Icha,

The greatest part of the population was concentrated on the southern islands, where limited cultivation of rye, wheat, barley and types of vegetables is possible. The principal occupations of the inhabitants--if we can judge from conditions before 1945--were, however, fishing and the hunting of sea mammals. Every summer the population was enlarged by around 10,000 fishermen, who came from Japan and occupied the islands for the catching season. In terms of the value of its yield, fishing was in first place by far, but the catching of walruses also played no insignificant role. The whales, after their summer stay in the Bering Sea, moved along the Kurils in the fall to their winter places in the southern part of the Sea of Okhotsk. In addition, seals and sea lions were also hunted.

After the islands were taken over by the Soviet Union and the greater part of the Japanese had been evacuated, numerous central fishing stations were founded on the islands. Furthermore, a walrus-catching fleet was stationed there, and a walrus-processing works was erected on one island. It is also planned to take up the breeding of fur-bearing animals such as the Japanese had begun.

Because of their volcanic character, the Kurils have numerous hot springs, which for the most part contain minerals. In natural resources the Kurils are poor; only a few of the islands contain rather large sulfur deposits. Exploitation of these deposits for the Soviet economy is being considered.

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